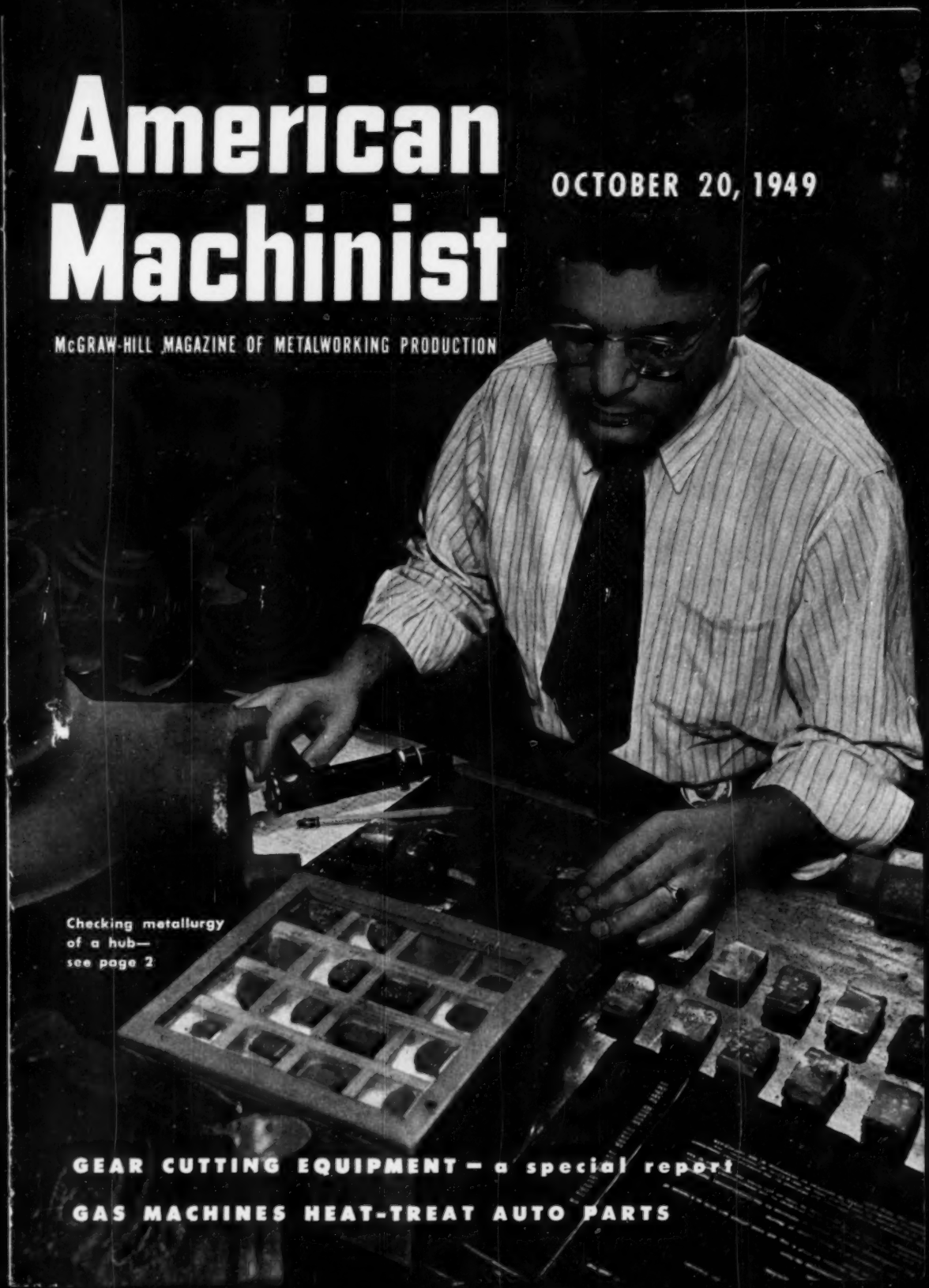
American Machinist

OCTOBER 20, 1949

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Checking metallurgy of a hub—
see page 2

GEAR CUTTING EQUIPMENT — a special report

GAS MACHINES HEAT-TREAT AUTO PARTS

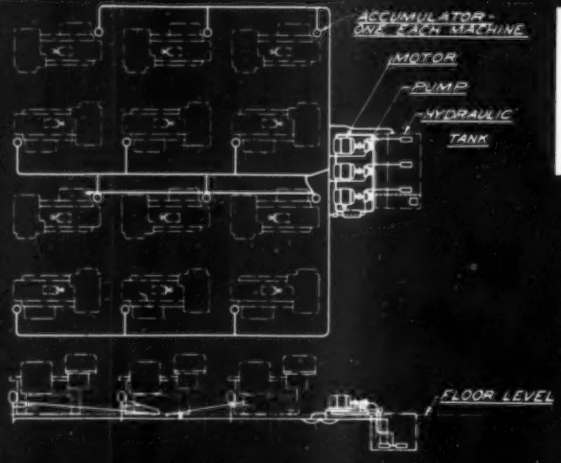
How Heald engineering saves on initial investment, maintenance and operating costs

Heald engineers apply unique battery type installation with central hydraulic system to high production internal grinding.

Production men everywhere know what a Heald Internal Grinder can do to boost production, improve product quality, and reduce overall cost per part. And, as the solution to a specific high-production grinding problem, Heald engineering has now developed a method of operating several of these high-speed, fully-automatic machines from a single hydraulic power source, central coolant supply, and central hi-frequency electric power source where applicable.

Where large volume production is required, Heald-engineered battery type installations have proved extremely profitable. Because these Internal Grinders are completely automatic, several machines can easily be tended by a single operator. And because all machines operate from a single hydraulic power unit, these battery type installations offer important savings in initial investment, maintenance, and operating costs.

Regardless of your quantity requirements, you can depend on Heald engineering to help you increase production and reduce the cost of precision finished parts. Your nearest Heald representative is qualified to give you expert assistance on any grinding or borizing problems.



Diagrammatic sketch shows one suggested plan for battery type installation with central hydraulic system. Whether your internal grinding requirements adapt themselves to a single unit or battery type installations, Heald field engineers will be glad to study your needs and make helpful recommendations.

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

THE HEALD MACHINE COMPANY
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American Machinist

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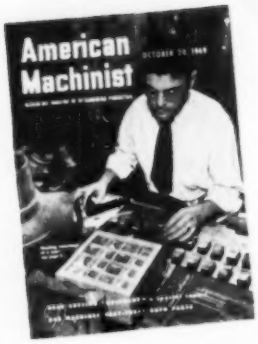


Chips and QUIPS

Our Cover . . . Taken at Hamilton Standard Propeller, Div. of United Aircraft Corp., East Hartford, Conn., our cover shows a metallurgist comparing clippings from forged propeller parts with standard samples (in the glass-covered box in foreground) to determine proper heat-treatment.

Mid-Century . . . As you no doubt are aware, our next issue (Nov. 3) will be devoted to the regular 5-year Inventory of Metalworking Equipment. We're changing the format somewhat—presenting it as a series of unit tables instead of in one outsize table. Then we're providing trading-area breakdowns, more than 20 in comparison with our former seven geographic areas. Work has been about triple that of previous Inventories. We decided to give this one a special name, too: The Mid-Century Inventory . . . Now comes belated word that there are only twelve leap years in the first half-century, but thirteen in the last half (because the year 2000 is a leap year, but 1900 was not). Anyway, the exact calendar midpoint of the current century is noon of Jan. 1, 1951. So don't celebrate prematurely about anything except the speed with which this Inventory was completed—about twice as fast (for first reports) as we've ever done.

Buick Heat-Treating . . . H. A. Maloney, plant metallurgist for Buick, describes in our lead article a series of localized heat-treating operations on Dynaflow parts. Included are Flamatic hardening, Budd electronic hardening of rocker-arm ends, and Tocco hardening of a ball stud. We've presented it principally in pictures . . . This issue is, incidentally, unusual in the number of drawings it carries.

Gear-Cutting . . . We've three articles on gear cutting in this issue, the first a Special Report on gear-cutting equipment, and the second Part II of J. P. Breuer's series on multiple-thread hobs. Both have been in preparation for some time. Mr. Pfeffer has three reports in his series, so this one will be followed by further installments on finishing and inspection. They've been underway for a year. Mr. Breuer's story of a new development concludes herewith . . . The third article is on making a long cam—but it's done on a gear shaper and is really a wide-face, irregular-toothed, straight or helical gear.

Shorts . . . At the last moment we found it possibe to include several short articles, one on a pneumatic lift section that increases the versatility of a conveyor, another a group of the ever-popular Short Cuts. The third is a group of fixtures for disk grinding . . . And notice the number of detail-packed drawings.

Die Fundamentals . . . Readers interested in metal forming will find a feast in this issue—three articles, one on knockouts, one on heavy forming and a Reference Book Sheet on drawing dies . . . J. A. Paquin continues his series with 14 methods of applying positive knockouts and and explanation of their advantages compared with spring strippers . . . Ernest Noreen, supervisor of tool design at Link-Belt, shows how to cut costs by standardizing segmental dies . . . And we have a "first"—a chart which permits selection of a minimum draw-die diameter series to suit metal.

More Tooling . . . In addition to articles on gears, heat-treating and dies, we present two other tooling articles, one on light gages and one on a special milling setup . . . Bernard Better of Scully-James describes gages for measuring tapers by means of light behind a knife edge, and Joseph K. Row explains a cutter that cuts corners in blind holes and dies to close tolerances.

Job Hint . . . One of our authors who was in business for himself has just taken a job. Wrote he: "The powers that be at ——— were quite impressed by the tearsheets of my articles. My new position is financially worth while and had to be secured in a tight job market. Many of the applicants had more years of experience than I have. I believe that my articles were definitely instrumental in swaying the decision in my favor."

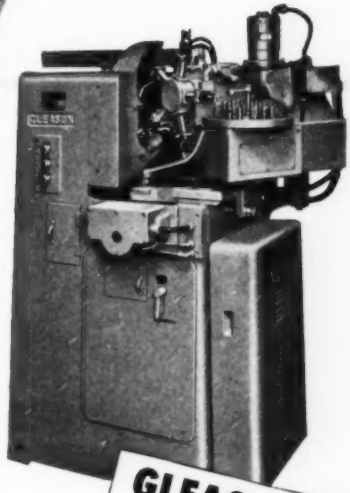
GEAR CONSULTANT . . . Charles G. Pfeffer is a New Yorker who made good. Born in New York City, he went to school there as well, and studied at two New York colleges, Brooklyn Poly and Columbia. Then followed 18 years of working in machine-tool plants, three years making printing presses, 14 years making aircraft engines, latterly specializing in making tricky and precise gears for Wright Aeronautical. For the past three years, he has been a consultant on gear design, manufacture and development of components for gear drives. Our current Special Report is his painstaking work.

CONTINUOUS PRODUCTION

with Automatic Loading

The New Automatic loader enables the Gleason No. 2 Hypoid generator to produce continuously without stopping—thus eliminating "down time" on the machine.

The Gleason No. 2 Hypoid Generator is a versatile generator, providing close control of actual cutting at faster times than previously possible. This machine produces spiral bevel, Zerol bevel and hypoid gears and curvic clutches in the small sizes (16 D.P. and finer) with a superior tooth bearing. Whether it is used for jobbing or production, the No. 2 Hypoid Generator is ideally suited for the production of bevel and hypoid gears for small tools and appliances.



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Works
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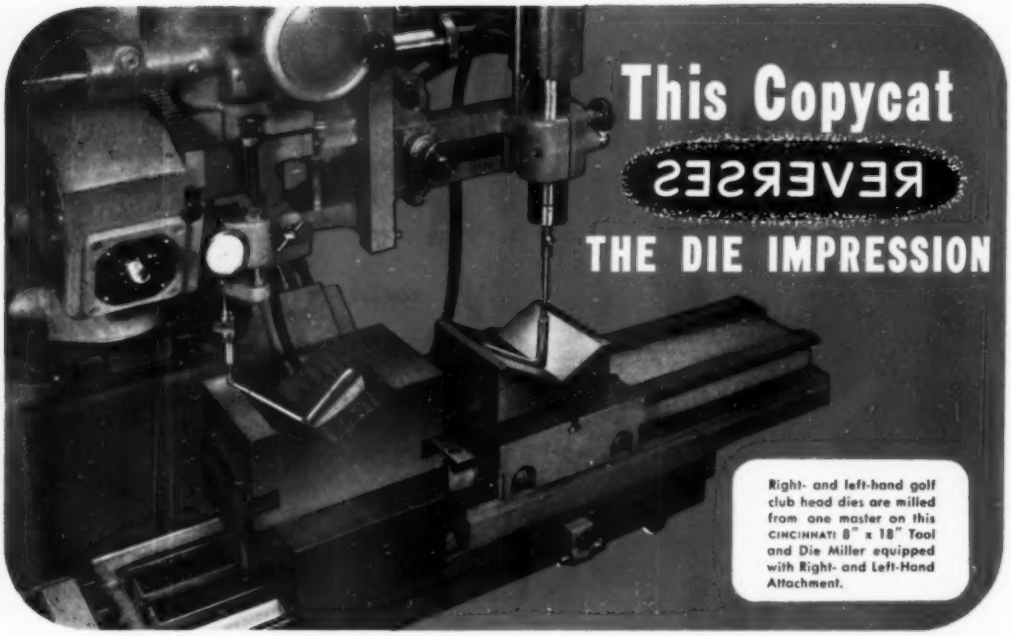
Rochester 3, N.Y., U.S.A.

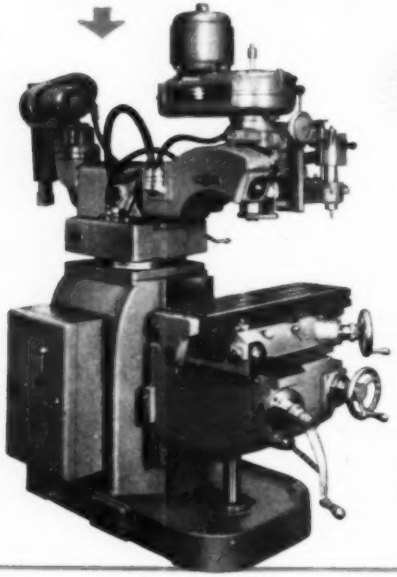
Builders of Bevel Gear Machinery for Over Eighty Years

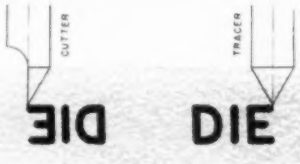


This Copycat REVERSES THE DIE IMPRESSION

Right- and left-hand golf club head dies are milled from one master on this CINCINNATI 8" x 18" Tool and Die Miller equipped with Right- and Left-Hand Attachment.

CINCINNATI 8" x 18" Tool and Die Milling Machine. Complete data may be obtained by writing for catalog M-1620-1.





CINCINNATI

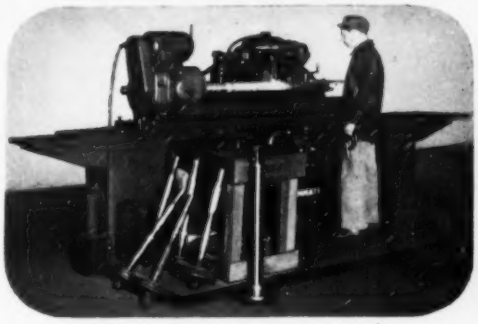
A left-hand die, copy milled from a right-hand master! That's one of the cost saving advantages offered by CINCINNATI 8" x 18" Tool and Die Millers with the Right- and Left-Hand Attachment. The attachment is demountable; you can remove it and make die impressions in the conventional manner. In either case you can be sure of accurate, faithfully reproduced dies that can be hand finished in a fraction of the time you might expect. ¶ The "copycat" unit, technically known as "automatic hydraulic depth control unit" may also be removed, converting the machine into a versatile toolroom miller. **The same machine handles diesinking and other milling operations required to finish the die.** ¶ Additional information about CINCINNATI 8" x 18" Tool and Die Milling Machines may be obtained by writing for literature. Brief specifications will be found in Sweet's.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Typical shop shot, showing a CINCINNATI FILMATIC 14" Hydraulic Universal in action and the work assigned to it. Manufacturing quantities vary from one to five parts.



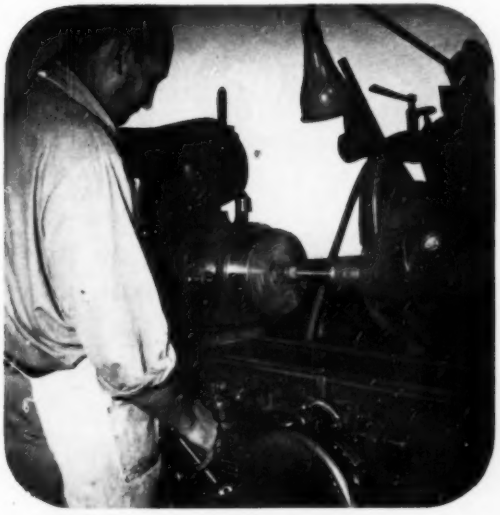
To make a long ~~story~~ SETUP short

CINCINNATI FILMATIC UNIVERSAL GRINDERS

Save Time in your Shop

FILMATIC

• How long does it take to get going on small lots? Whatever the answer is, set-up time constitutes one of the major elements in the cost of small quantity precision toolroom grinding. Reduce set-up time and costs go down fast. You can be sure of brief setups on CINCINNATI FILMATIC Hydraulic Universals, for they have many features of value in small quantity production. To mention only three: hinged type internal grinding attachment, always on the job; FILMATIC spindle bearings, never require adjustment; lathe standard spindle nose on headstock. ¶ The photographs show three setups which take advantage of CINCINNATI FILMATIC Hydraulic Universals' many features. Others have just as much value in reducing costs. Write for catalogs: G-486-5 for 12" machine; G-474-3 for 14" and 18" machines. Brief specifications in Sweet's.



The internal grinding head is ready for work in a minute or less. In the illustration, the hole in a drill jig bushing is being ground to accurate size.

Grinding an internal broach on a CINCINNATI FILMATIC 14" Hydraulic Universal Grinder. The taper portion is ground by the traverse method, and then each tooth is "backed off" separately.

CINCINNATI

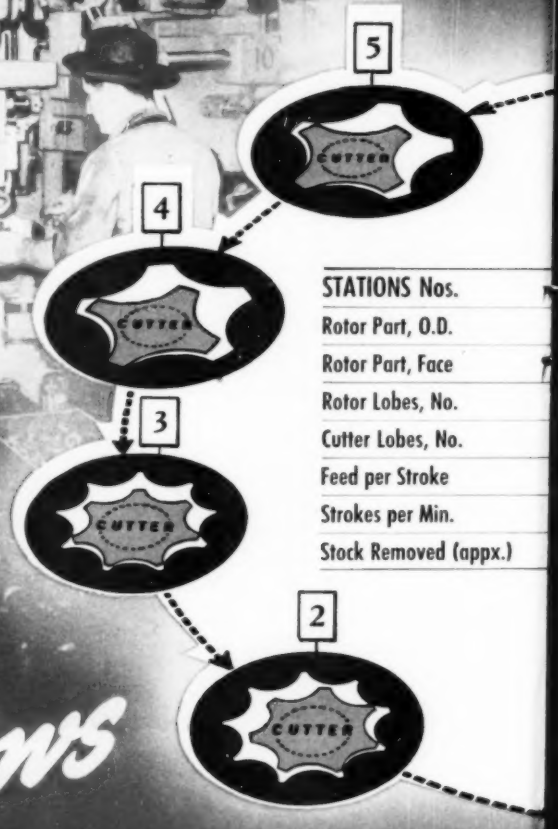
CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

Flexibility well utilized

Inner and Outer Rotors for an Eaton Rotor Pump. When assembled, the respective centers are offset .052" to .150" depending on size.



STATIONS Nos.
Rotor Part, O.D.
Rotor Part, Face
Rotor Lobes, No.
Cutter Lobes, No.
Feed per Stroke
Strokes per Min.
Stock Removed (appx.)

Fellows

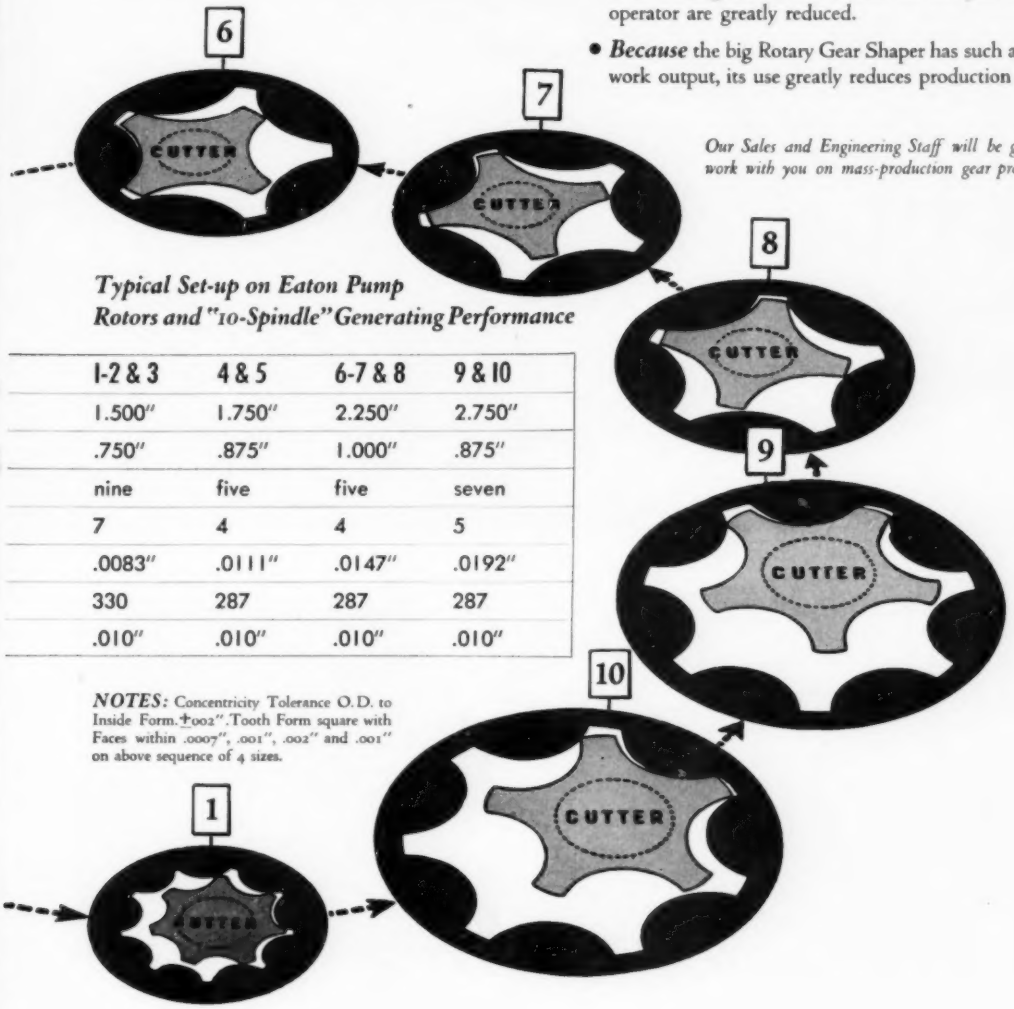
THE FELLOWS GEAR SHAPER COMPANY - Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
Branch Offices: 616 Fisher Bldg., Detroit 2 - 660 West Town Office Bldg., Chicago 12 - 7786 Empire State Bldg., New York 1.

on EATON PUMP Rotors...

FELLOWS NO. 10 ROTARY GEAR SHAPER finish cuts inner profile of 4 different size Outer Rotors—at a rate of one (1) every 10 seconds.

- ***Because*** each of the 10 gear cutting stations is a completely independent unit, one type of gear or up to ten different jobs can be set up in combination.
- ***Because*** of the precision inherent in "The Rotary" and in Fellows Cutters, close limits can be maintained. Critical size dimensions can be accurately controlled for the life of the cutter.
- ***Because*** work can be held in automatically operated work-holding outfits, the efforts on the part of the operator are greatly reduced.
- ***Because*** the big Rotary Gear Shaper has such a high work output, its use greatly reduces production costs.

Our Sales and Engineering Staff will be glad to work with you on mass-production gear problems.

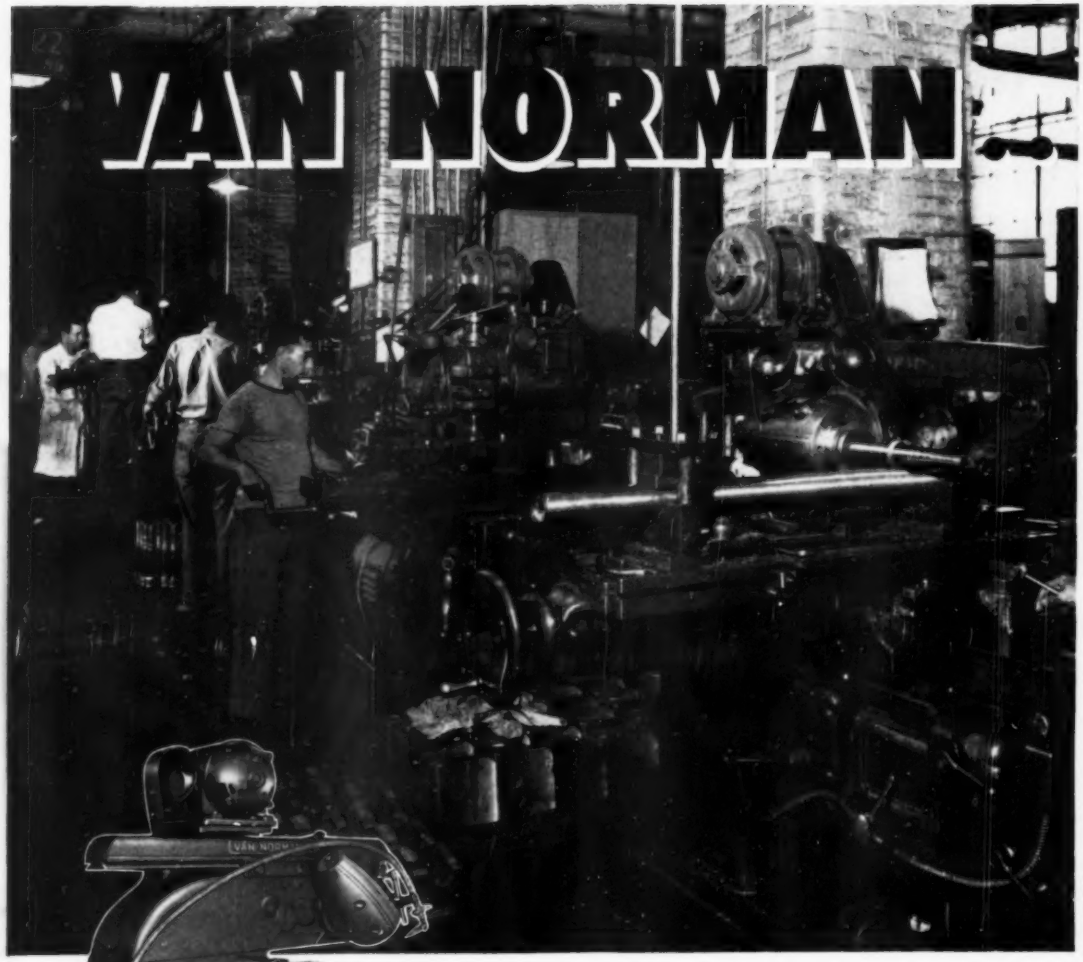


Typical Set-up on Eaton Pump Rotors and "10-Spindle" Generating Performance

1-2 & 3	4 & 5	6-7 & 8	9 & 10
1.500"	1.750"	2.250"	2.750"
.750"	.875"	1.000"	.875"
nine	five	five	seven
7	4	4	5
.0083"	.0111"	.0147"	.0192"
330	287	287	287
.010"	.010"	.010"	.010"

NOTES: Concentricity Tolerance O.D. to Inside Form. ±.002". Tooth Form square with Faces within .0007", .001", .002" and .001" on above sequence of 4 sizes.

VAN NORMAN



No. 26
Table: 58" x 13"
Over 16 other models available . . .
A size for every application.

HORIZONTAL MILLING

Ram Type Millers

Increase Milling Capacity

Adjustable Cutterhead Permits One Machine to do the Work of Three

Conventional horizontal, vertical or angular milling . . . all with one machine . . . that's what you get with a Van Norman Ram Type Miller.

All you need do is position the adjustable cutterhead in the desired cutting position and you are ready for the cut. In addition to its versatility, the ram type miller reduces work set-up time to a minimum because many jobs can be carried through to completion without re-setting up of the work piece.

Van Norman Ram Type Millers are easy to operate. Front and rear controls permit operation from either location. Hardened and ground steel fixed cutterhead stops permit true settings at horizontal or vertical position. The rugged construction throughout assures accuracy and long operating life.

Investigate Van Norman Ram Type Milling Machines for toolroom, laboratory, pattern and die work and production milling. It will cut costs, increase production. Write for catalog.

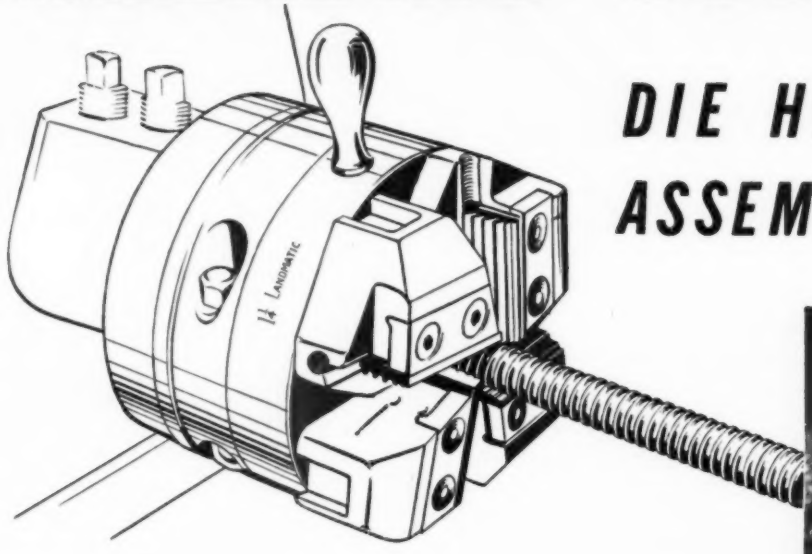
VAN NORMAN COMPANY

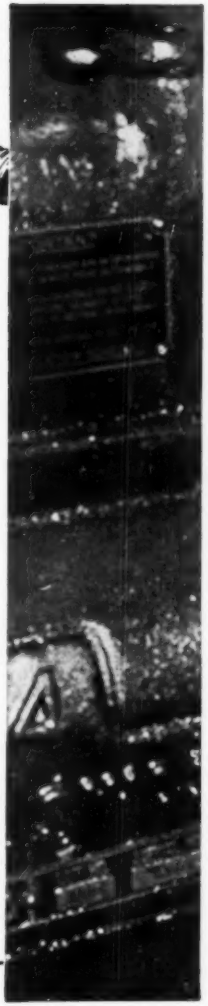
SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

THREADING COSTS

DIE HEAD ASSEMBLY





Time Study and Methods Department records of a large aviation equipment company furnish data of still another job where LANDMATIC Heads have effected large savings in machine time and assembly and improvements in product quality.

In this operation, the 1¼" LANDMATIC Head on a turret lathe equipped with Leadscrew is cutting a ⅝-6 Acme thread on a Stabilizer Screw used by a light aircraft manufacturer. The thread was held to the close tolerance of ± .001 between the P.D. of the thread and the O.D. of the screw, for a full thread length of 5⅜" on cold-drawn piston stock, Spec. #AISI, B1112.

Former methods required two passes to produce the finished thread—one roughing and one finishing cut. The thread is now cut in one pass in .192 at a spindle speed of 230 R.P.M. Approximately 400 pieces are cut between chaser grinds. Hand fitting with the mating nut in assembly, previously necessary, has been eliminated. Total cost savings in all operations are in excess of 75%.

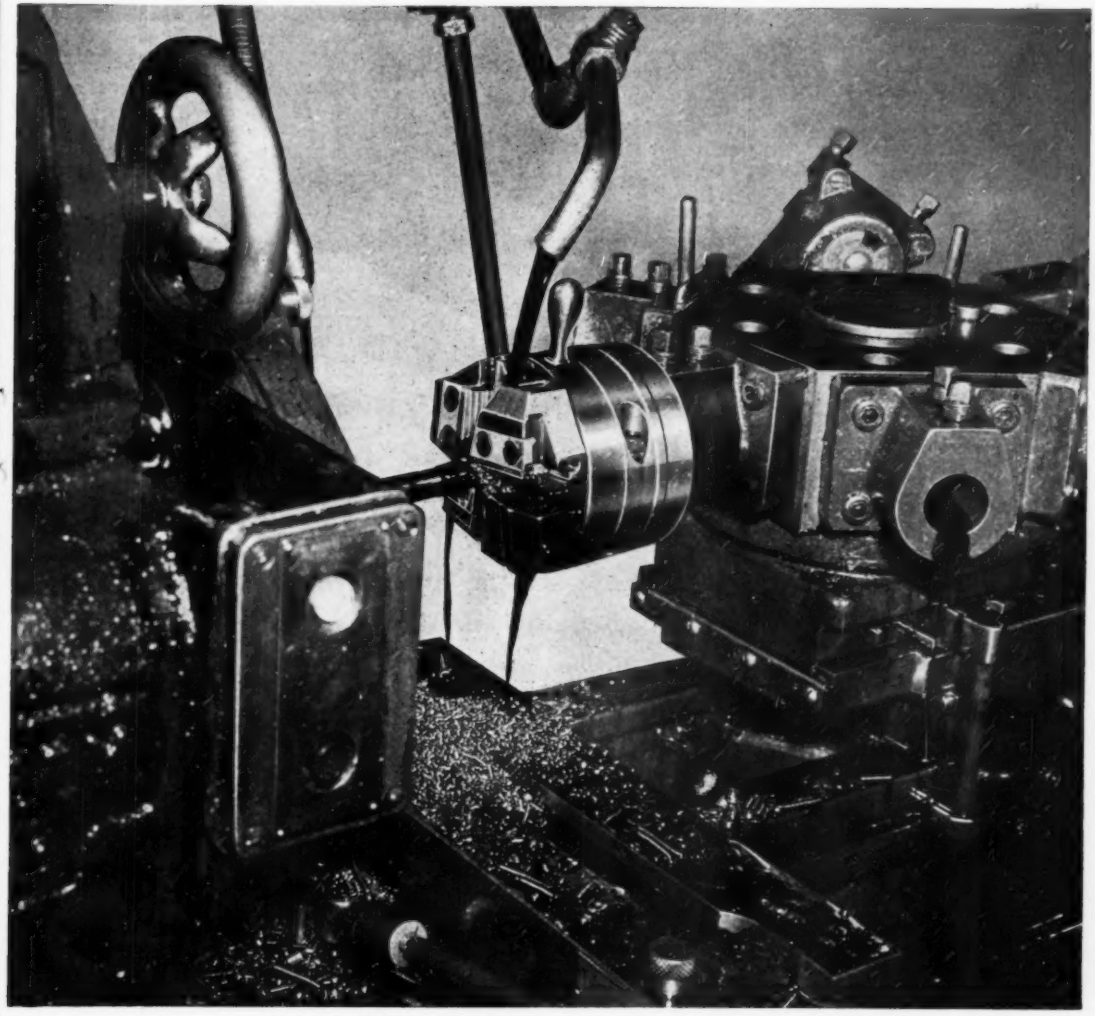
LANDMATIC Heads are stationary threading heads with self-opening action designed primarily for turret lathes. Their unusually-large oversize capacity makes them ideally suited for these machines. For detailed information and specifications, write for Bulletins F-80 and F-90.

LANDIS *Machine* COMPANY

WAYNESBORO · PENNSYLVANIA · U.S.A.

CUT BY OVER 75%

CUTS COST OF PRODUCTION & OF STABILIZER SCREWS!!



LANDIS TOOL

hydraulic

operation

provides

THE VELVET TOUCH

10" x 24" Type CH Hydraulic Universal Grinder. Catalog I-45

EQUIPPED WITH MICROSPHERE BEARINGS

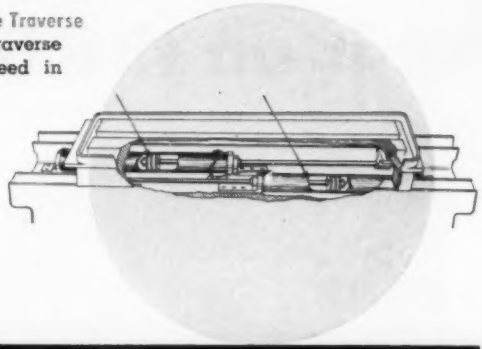
LANDIS TOOL *Precision Grinders*

LANDIS TOOL leadership in the application of hydraulic operation to precision grinders is an important factor in the high production and fine finish which is obtained on these machines.

We shall be glad to send you, on request, our new condensed catalog which describes the features in more detail and gives condensed specifications for the complete line of LANDIS TOOL standard and special purpose precision grinders.

Smooth Hydraulic Power for Table Traverse

Double cylinder hydraulic traverse gives constant work table speed in either direction.

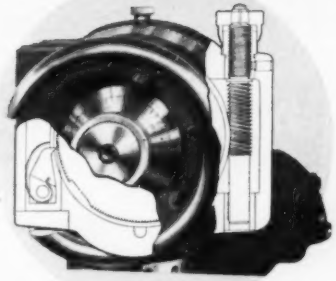


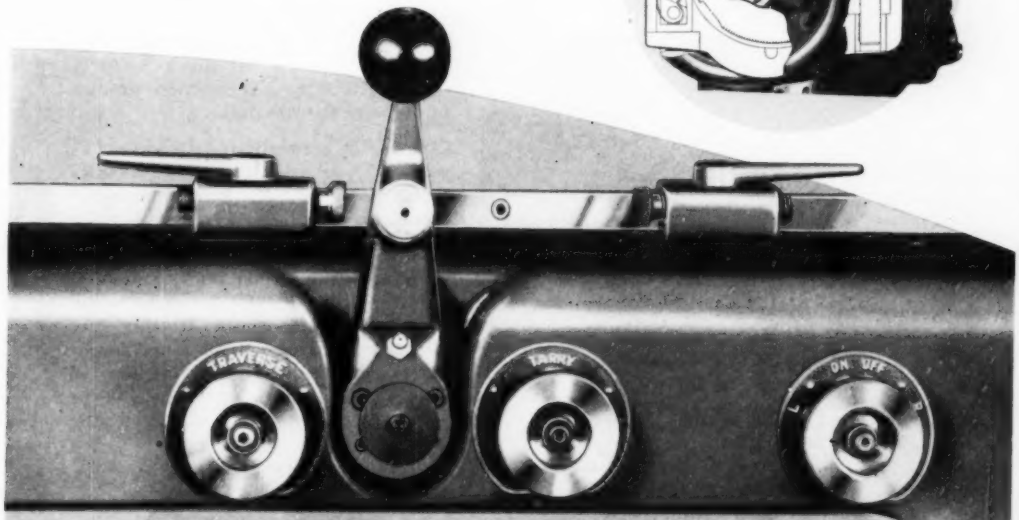
that Produces Fine Finishes

Hydraulic Automatic Wheel Feed

Lowers Setup Time, Increases Production

At table reversal the wheel feeds up hydraulically by the amount preset on the graduated adjusting knob.





RATE OF TRAVERSE
Easily adjusted to fit the grinding job.

TARRY AT REVERSAL
Adjustable for type of traverse grinding.

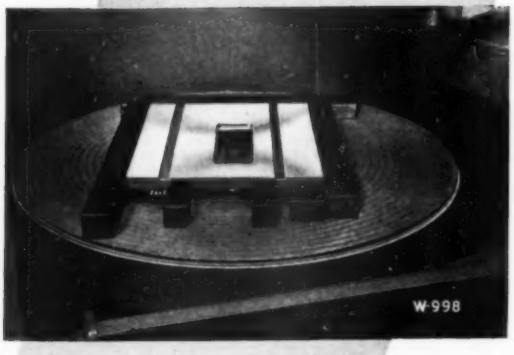
AUTOMATIC WHEEL FEED SELECTOR
Conveniently located. Helps to lower setup time.

features of LANDIS TOOL Hydraulic Universal Grinders

1. MICROSPHERE WHEEL SPINDLE BEARINGS
2. EYE LEVEL WHEEL FEED
3. HYDRAULIC OPERATION
4. VARIABLE SPEED HEADSTOCK
5. RAPID HYDRAULIC WHEEL POSITIONING
6. SWINGING INTERNAL FIXTURE

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

Put it on the Blanchard



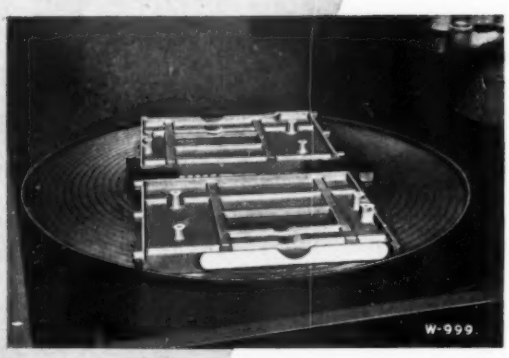
Material: Aluminum Castings

Size: 14¼" x 18"

Held on 36" magnetic chuck on the No. 18 Blanchard Surface Grinder by means of suitable steel or cast iron blocking pieces.

Proper finishing of these aluminum saw table castings required the removal of 1/16" of metal from both sides, to a flatness of .004". The job was put on the Blanchard No. 18 surface grinder in two operation sequences. The broad side is ground first —*to a flatness of .002"*. The flatness and finish of the Blanchard ground surfaces are such that no other finishing or corrective operation is necessary.

They asked for flatness of .004" – They got .002"

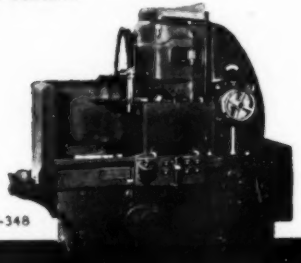


The second operation permits two pieces being laid flat on the chuck, securely held and thus the reverse side is ground to the same flatness limits.

The rate of production is 8½ pieces (17 surfaces) per hour, 8½ of the surfaces being broad and 8½ being narrow or ribbed.

The Blanchard Grinding of these aluminum saw tables was the most economical way to produce smooth flat surfaces and meet customers' limits. In this case Blanchard beat the limits asked for by customer. If the surface must be flat and parallel bring it to the Blanchard for best results.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



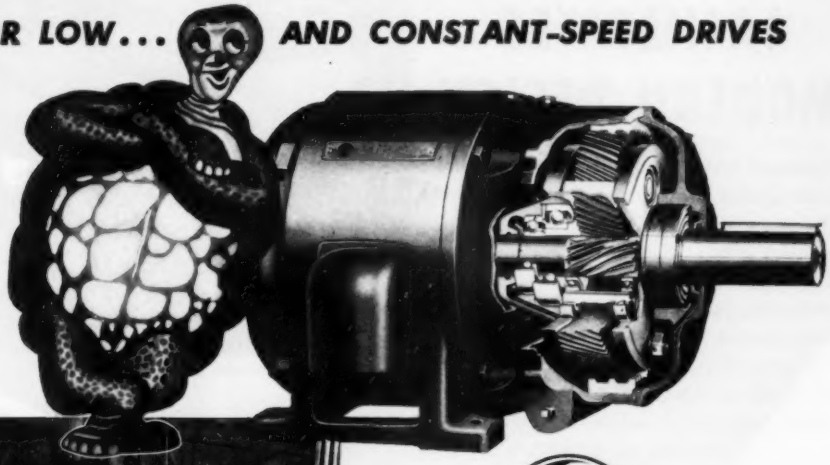
BLANCHARD

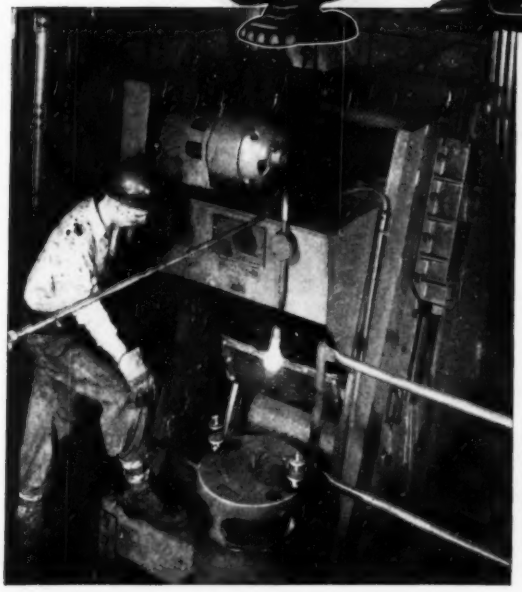
The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

IMMEDIATE DELIVERY

FOR LOW... AND CONSTANT-SPEED DRIVES





Here is a typical gear-motor installation. This secondary refuse elevator in a coal processing plant had to have a low-speed drive that would fit conveniently into a tight spot. A G-E Tri-Clad gear-motor is right there with all the answers on this job. It can do the same kind of a superior job for you.

GEAR-MOTORS

We have the gear-motors you need available in most ratings right off the warehouse shelf. Standard units are now available on normal shipments of one to three weeks.

General Electric's planetary gear system gives an additional 1:1 ratio of reduction. This type of transmission prevents slippage and minimizes mechanical power losses.

When you buy a General Electric Tri-Clad gear-motor you are buying:

- **Extra load-carrying capacity in a smaller space**
- **Easier mounting in a smaller space**
- **Industry proved Tri-Clad construction**
- **Higher operating efficiency because of low power losses**
- **Reduced maintenance costs**
- **Safe operation**

For the majority of your low-speed drives, standard G-E gear-motors fill the bill. Our engineers can meet special requirements by designing to your specifications.

To fill your needs on all gear-motor requirements, call your nearest General Electric Sales Office or your local distributor. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

LINK-BELT ROLLER CHAIN FACILITATES MODERN DESIGN

Engineers find in Link-Belt Precision Steel Roller Chains and Sprockets a ready means of incorporating in their designs, certain features of special importance.

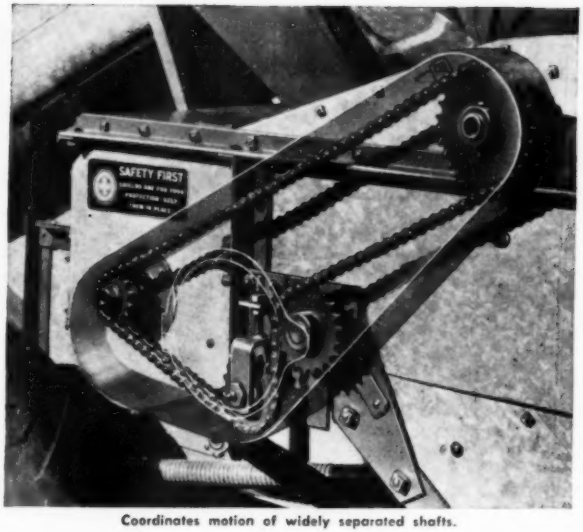
Positive transmission of power, efficient conveying, compactness, wide flexibility of arrangement, ability to absorb shock, are characteristics of roller chain which are enhanced by the precision manufacturing methods and metallurgical control followed in the huge Link-Belt chain plant.

Link-Belt Precision Steel Roller Chain runs slack on long or short centers, minimizing shaft bearing pressure, and operates at highest efficiency, since there is no possibility of slip. A number of shafts, turning in either direction, can be grouped in a single drive. The flexibility of each joint supplies a general cushioning effect, absorbing rather than transmitting shock from one shaft to another.

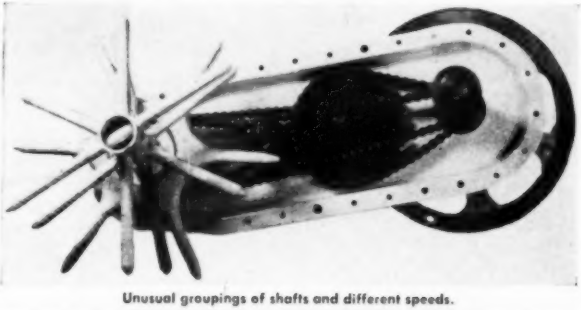
Link-Belt Precision Steel Roller Chain and sprockets are available immediately, in single or multiple widths, in ⅜" to 2½" pitch. Also with various types of attachments as well as the Universal Carrier, Flat-top, double pitch and horizontal plane bend types of chain. Made to manufacturers' (A.S.A.) standards. Send for Data Book No. 1957-A.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11 634

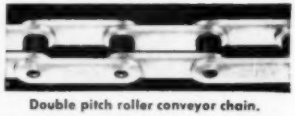


Coordinates motion of widely separated shafts.

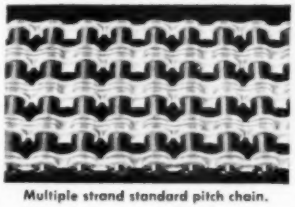


Unusual groupings of shafts and different speeds.

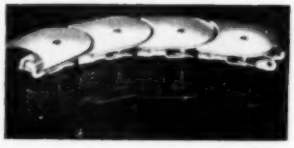
Single strand standard pitch chain.



Double pitch roller conveyor chain.



Multiple strand standard pitch chain.



Universal Carrier chain, flexes in 2 planes.

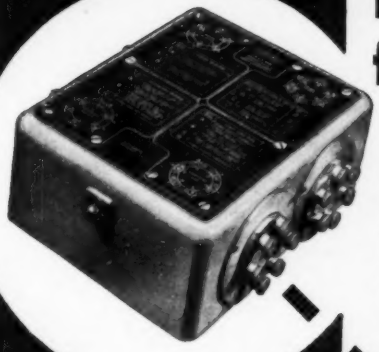
Ewart Plant — Link-Belt Company — Indianapolis, Ind.

LINK-BELT

THE SYMBOL OF QUALITY — LB — LINK-BELT

ROLLER CHAINS & SPROCKETS

World's largest makers of Chains for Power Transmission and Conveying



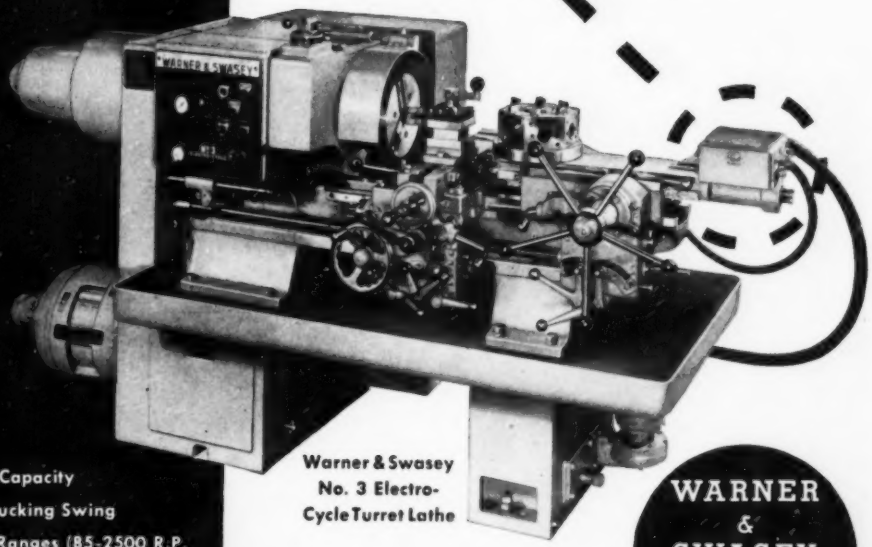
New *Electro-Cycle* TRADE MARK control for faster, easier turning of all metals

MACHINE HANDLING TIME and operator fatigue are problems in your production . . . and the Warner & Swasey No. 3 Electro-Cycle Turret Lathe is a natural solution. Most time-taking and tiring manual operations are eliminated for the operator when the Electro-Cycle control takes over.

This automatic control directs the functioning of the spindle for each hex face. Spindle start, direction of rotation, speed changes, reversal and stop, and positioning for ease in loading are all automatically controlled. Setting the control takes but a few seconds.

The Electro-Cycle principle has been used profitably for some time in the brass shops. Now it is available in the new No. 3 Electro-Cycle Turret Lathe to serve *all* of your long and medium run production needs on *all* metals.

After studying your jobs, the nearest Warner & Swasey field representative can tell you where the Electro-Cycle fits into your operation. Call him now, or write . . .



Warner & Swasey
No. 3 Electro-
Cycle Turret Lathe

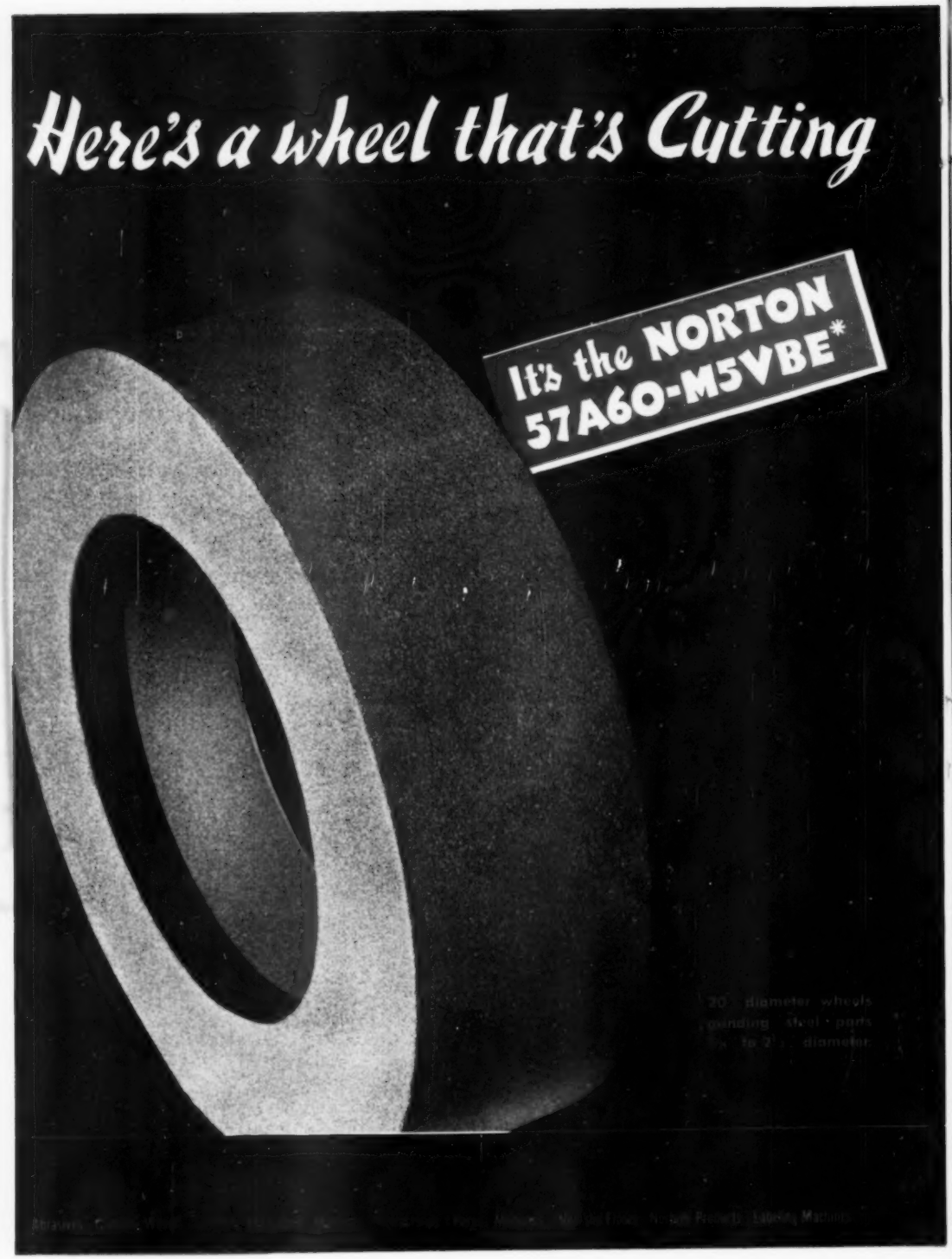
1½" Bar Capacity
15⅜" Chucking Swing
5 Speed Ranges (85-2500 R.P.M.) available during setup
4 Speeds automatically available during operation

You can machine it better, faster, for less...with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, MULTIPLE AND SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

Here's a wheel that's Cutting



Centerless Grinding Costs

YES, in hundreds of plants they are finding that this Norton wheel —the 57A60-M5VBE*—has just the right characteristics to give the lowest possible costs on their centerless grinding jobs. Its sharp, tough 57 ALUNDUM abrasive and BE bond combine to give both a *fast cutting action* and *long life*.

But this wheel may not be the answer to *your* particular centerless jobs. You may need the extra sharpness of the sensational new 32 ALUNDUM abrasive or the extra toughness of regular ALUNDUM abrasive, or even a hard, sharp silicon carbide like CRYSTOLON abrasive. But whatever *your* centerless grinding jobs may be, you can be *sure* that the Norton line includes a wheel that will do each one at *minimum cost*—a wheel with exactly the right combination of abrasive, bond, grain, grade and structure.

And you can also be sure that, handy to you, there's a Norton abrasive engineer or a Norton-trained distributor man to see that you get the right wheel on each job. Get in touch with him right away for lower grinding costs.

W-1248

REGULATING WHEELS A801-ROR-30

Equally popular is this Norton rubber bonded regulating wheel. It has a positive driving action, wears evenly and has long life. Available in harder and softer grades if your jobs require them.

NORTON ABRASIVES

NORTON COMPANY, WORCESTER, MASS.

Improved Spindle Design

The diameter of this spindle has been increased to 3¼", adding 37% to its rigidity.

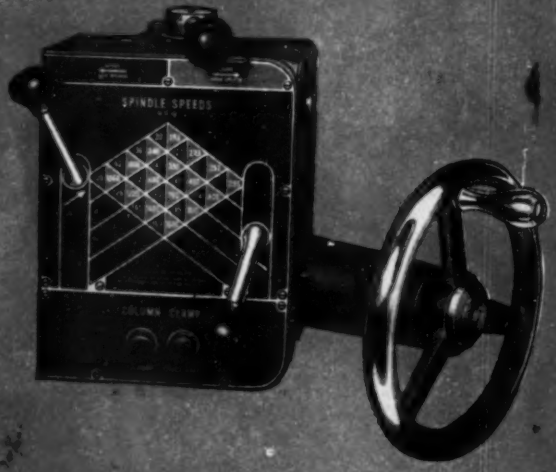
For long life the 100% anti-friction design of the Hole Wizard Spindle with adjustment for wear insures frictionless operation ahd maintenance of original accuracy. When severe drilling, tapping, or boring operations are performed thru the large driving gear of the Double Lo-Hung Drive, all thrusts are taken by the large bush, as shown by the accompanying illustration, which completely relieves the spindle of such stresses and definitely prolongs its life and accuracy.

The spindle and mating sleeve are made of nitralloy, nitrided to 70 Rockwell C—impervious to wear. Because of this extreme hardness, the running clearance between the ground spindle and honed sleeve is reduced to .00025". This spindle stability is especially valuable for exacting boring jobs.

Speed Changes made Quickly

and without confusion . . .

The Hole Wizard speed-changing mechanism is DIRECT READING. The operator no longer has to refer to instruction charts in order to make speed changes. The speeds are right in front of him in plain view and all he has to do is to move the levers to the speed he wants. The ease and rapidity of speed changing on the Hole Wizard encourage the operator to use correct speeds for his work.



THE AMERICAN TOOL WORKS CO.

The Double Lo-Hung Spindle Drive has definite virtues

This combination insures long gear life, a continuance of smooth power flow and freedom from gear noise.

It provides two (2) spindle driving gears. Of the 32 spindle speeds provided the 16 high speeds are secured thru the smaller of the two gears while the 16 slow speeds are secured thru the larger gear. By providing a smaller diameter driving gear for the high speeds, gear velocities can be held within reason, and by providing a large driving gear for the slow speeds, which are used for the severest operations, gear tooth pressures are kept correspondingly low.

It minimizes tooth pressures from severe operations.

It reduces the velocity of the driving gears on high spindle speeds.

This ideal drive which divides the driving service between two gears is exclusively "American".

Design Features that pay dividends to Hole Wizard Users . . .

1. Automatic oiling and cleansing of column sleeve to prevent "column scoring."
2. Tapping attachment speed-up that backs out taps 40% faster than tapping speed.
3. All gears and shafts hardened—all bearings anti-friction—elevating screw and back shaft hardened. All units anti-friction mounted and automatically oiled.
4. Safety nut guaranteed to prevent arm from dropping—a valuable safety feature.
5. Spindle speeds direct reading, instantly selected and secured—encourages operators to use correct speeds.
6. Auxiliary spindle counterbalance for handling heavy tools—provides same tension on spindle throughout entire travel.

Cincinnati, Ohio U.S.A. LATHES AND RADIAL DRILLS

LESS "pickup" LESS "splatter"

Use G-E slope control for resistance welders

Tip "pickup" in spot-welding aluminum and expulsion in projection welding is reduced with this new Slope Control developed at General Electric. It is a method of applying current in gradually increasing intensity that results in longer operation of electrodes without the frequent cleaning usually required.

Here, again, is evidence of the research continually conducted at General Electric to improve welding methods—to make the production of improved products easier and less expensive. Here are the answers to the questions we knew you'd ask about Slope Control.

Q. What is Slope Control?

A. It is supplementary equipment used with a standard synchronous or non-synchronous precision control panel that regulates the rate at which current rises to welding value, and is adjustable in terms of cycles to reach final current.

Q. What effect does this have on the finished weld, and is it slower?

A. Our tests have shown that there is less tendency for porosity, which means stronger welds, and that it does not appreciably slow the work. See the cross sections of welds made with Slope Control.

Q. Can I use it on my present G-E electronically controlled welder?

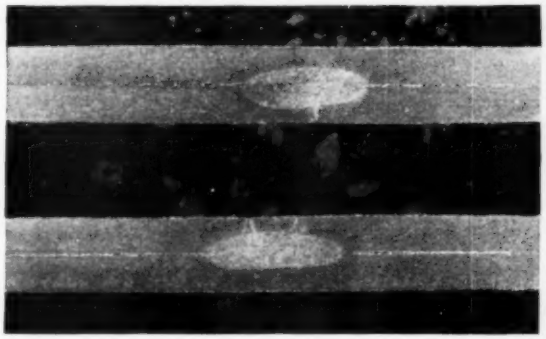
A. Yes. It is a separate panel that can be easily added to most modern G-E controls.

Q. With what types of welders and metals can it be used?

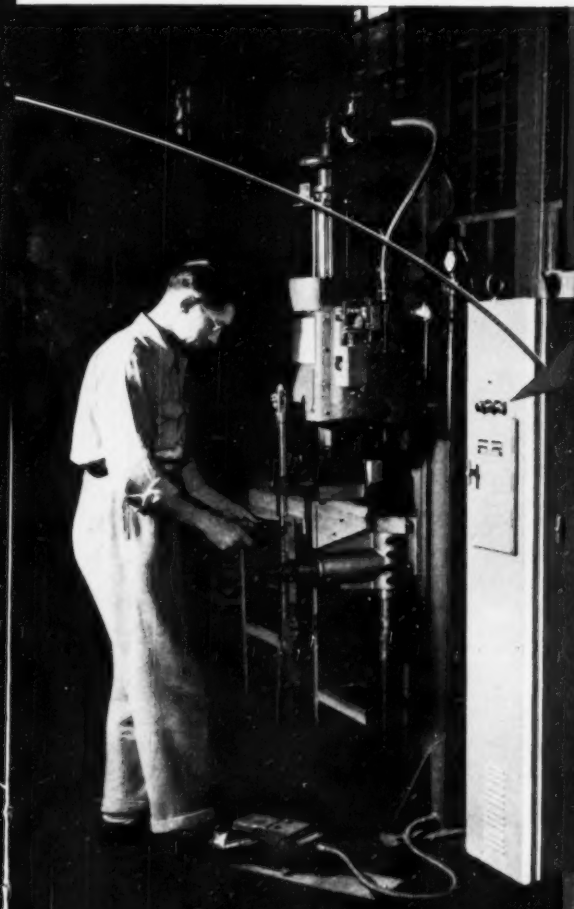
A. Use it for spot-welding aluminum (see the illustration), for projection welding aluminum or steel (it reduces expulsion), and for multiple projection welding, where you'll find improved results on non-uniform projections. It may be used with almost any metal, but aluminum and its alloys present a tough problem it can solve.

More details on G-E slope control in Bulletin GEC-534. Fill in and send in the coupon now. And when you have control problems for resistance welders, consult the nearest G-E sales engineer. He'll give you an unbiased answer based upon years of G-E experience with all types of welding. Whether it's a power factor problem, or the selection of the most suitable control for a specific job, you can be sure of your facts when they come from General Electric. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

Cross sections of aluminum spot welds produced with slope control (a microphotograph).

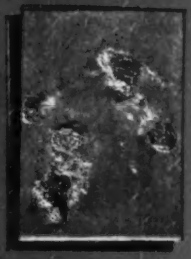


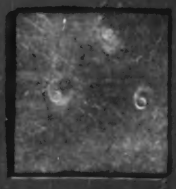
GENERAL ELECTRIC



Whether you're welding aluminum or heavy gage steel

...THIS IS FOR YOU





Splatter reduced. Compare surfaces of these aluminum plates. Above, welds produced with single-phase, synchronous precision electric controls. That on left, with the addition of slope control.

Projection welding with synchronous precision control. Slope control is mounted in side door of unit (small door open). Can also be used with standard 60-cycle spot welders having non-synchronous welding control.

ASK TO SEE "This is Resistance Welding," General Electric's More Power to America, four-color, sound motion picture covering every phase of this manufacturing process. Contains tips for improved production for operators of machines, design engineers, and supervisors. Contact your Resistance Welder manufacturer, Power Supplier, or the nearest G-E office.

Tip pick-up reduced. Electrode on left has been used 117 times with slope control. That at right used 41 times without slope control. Note wide area of aluminum pick-up.

General Electric Co., Sec. L645-50

Schenectady 5, N. Y.

Please send me Bulletin GEC-534 on Slope Control.

.....I would like a showing of "This is Resistance Welding."

NAME .....

ADDRESS .....

.....

P&W

CARBIDE GO AND NOT GO DUALOCK ADJUSTABLE *Thread Ring Gages*

ADJUSTABLE—
RELIEVED AT MAJOR DIAMETER—
CONVOLUTED—
PRECISION LAPPED—

. . . FOR LOW-COST PRODUCTION GAGING

These long-wearing Pratt & Whitney Carbide Dualock Thread Ring Gages are especially suited for *dependable* checking of external threads on both long- and short-run work, whether used at the machine or at the inspection bench. Retaining the precisely lapped thread form for unusually long periods — these carbide ring gages result in substantial savings in gage costs and eliminate the ultimate scrapping of parts passed by steel ring gages worn "bellmouth" or "off-angle". Even on short runs, the saving in scrap cost alone often more than equals the extra cost of these P&W Carbide Dualock Thread Ring Gages.

. . . FOR WORK HAVING CLOSE TOLERANCES

The great resistance to wear inherent in these Carbide Dualock Thread Ring Gages permits setting them to the full product limits, enabling users to disregard wear allowance usually applied to steel gages. The exclusive P&W precision lapping process produces a uniformly smooth surface over the entire thread flank, and corrects out-of-roundness and variation in thread angle.

We regularly furnish P&W Go and Not Go Carbide Dualock Thread Rings in the popular range of diameters and pitches in both American Standard and Unified Thread Forms. Modified Whitworth, Metric, etc., also can be furnished. For complete information and prices, contact our Branch Offices listed below:

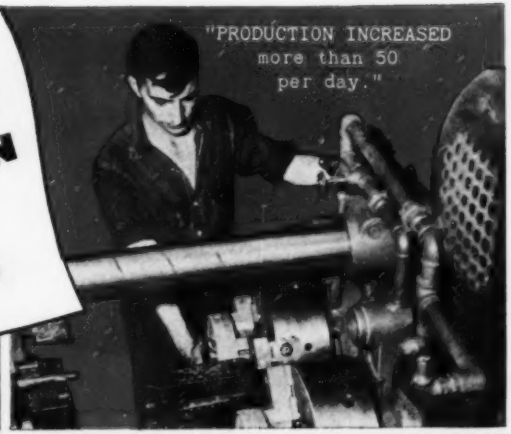
Pratt & Whitney

Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

BRANCH OFFICES AND STOCKS AT

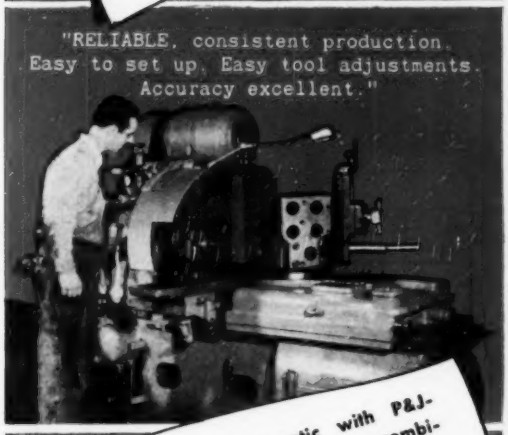
BIRMINGHAM	1716-19 Comer Bldg.
BOSTON	770 Main St., Cambridge
CHICAGO	565 W. Washington Blvd.
CINCINNATI	336 East 7th Street
CLEVELAND	1433 East 12th Street
DETROIT	2836 E. Grand Blvd.
LOS ANGELES	2675 Santa Fe Avenue
NEW YORK	117 Liberty Street
PHILADELPHIA	401 North Broad Street
PITTSBURGH	613 Grant Bldg.
ROCHESTER	89 East Avenue
ST. LOUIS	725 Central Terminal Bldg.
SAN FRANCISCO	1391 Howard Street

What Operators on the Production lines say about POTTER & JOHNSTON AUTOMATIC TURRET LATHES



"PRODUCTION INCREASED more than 50 per day."

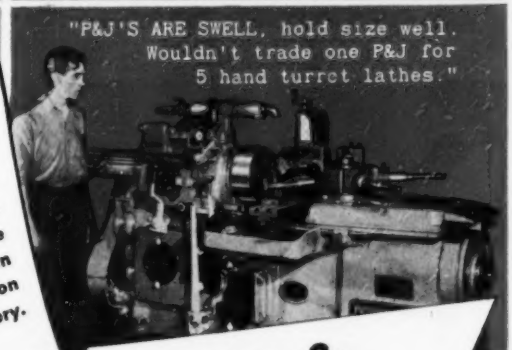
"RELIABLE, consistent production. Easy to set up. Easy tool adjustments. Accuracy excellent."



"GREAT IMPROVEMENT over ordinary turret lathes. Tool life very good."

Team-up any P&J Automatic with P&J-engineered tooling — and you have a combination that meets with conditions in any plant. Over 50 years' broad experience enriches P&J's highly specialized ability to attain the extreme versatility, precision and high speeds essential in today's competitive markets . . . and the ingenuity to design toolings to combine operations, reduce work handling to a minimum. This all adds up to fewer rejects in close-tolerance manufacture, and the greatest possible quality and economy in the quantity production of duplicate parts. A P&J estimate figured on your sample parts or prints will tell the story.

"P&J'S ARE SWELL, hold size well. Wouldn't trade one P&J for 5 hand turret lathes."



Potter & Johnston Company

Pawtucket, R. I.

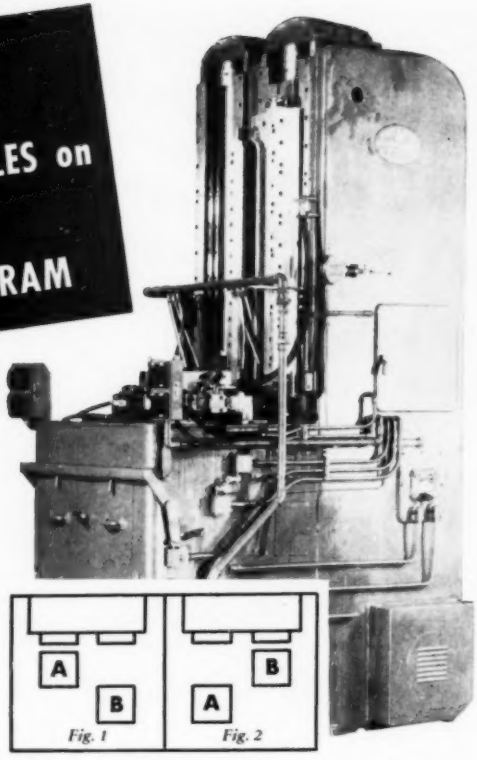
subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

P&J

P&J AUTOMATICS...

tooled for Production - Speed - Economy at Production Tooling Headquarters

Broaching WHEEL SPINDLES on American DUAL RAM



Straddle broaching the flange faces and the stem end of automotive wheel spindles in one pass was a broaching operation easily adapted to the American Dual Ram Surface Broaching Machine.

The combination of broaching the flange faces and stem end in one pass was possible because of the wide machine slides which are a standard feature on American machines. The part was manually located sideways on the fixture which was provided with a hydraulically interlocked clamp. As the broach assembly was duplicated on each ram and the fixture on each table, one part was broached complete in one pass at each station. This provided a high production rate for these wheel spindles, which are shown before and after broaching in the illustration below.

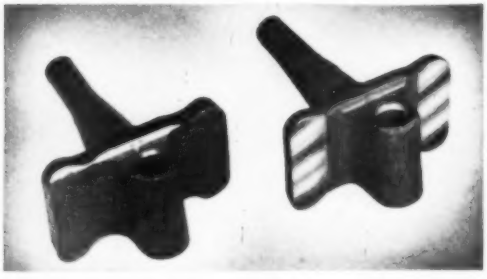


Fig. 1 *Fig. 2*

On the diagram above figures (1) and (2) illustrate the opening cycle of the receding type tables.

In figure (1) table (A) is in broaching position and table (B) is in unload and load position. In figure (2) the tables are reversed and the operator unloads and loads the fixture on table (A) while (B) is in broaching position.

All moving parts of the machine are electrically interlocked as a safety precaution for the operator and the tooling. The machine cycle can be arranged for semi-automatic operation whereby the operator starts each cycle or if the loading time does not exceed the broaching time continuous automatic cycle can be used.

American manufactures a complete line of hydraulic broaching machines for surface and internal operation.

If you have a metal removing operation send a blue print of the part with the required dimensions and hourly production, American engineers will recommend the machine and tooling for the operation without obligation.

Write for free literature Circular 300 covering American's complete line of hydraulic surface broaching machines.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

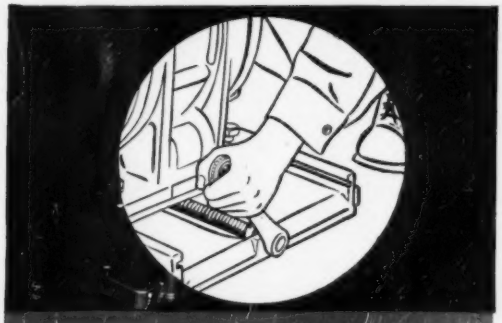
ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

Vari-Pitch
AUTOMATIC
SHEAVE

TO GO FASTER—

TO GO SLOWER—



ONE HAND DOES IT—

TEXROPE *offers Instant, Low Cost Way to*

Control Machine Speed

- Covers most speed changing applications from 1½ to 40 hp.
- Very simple — one sheave does everything automatically.
- Infinitely variable speed—100% increase; 2 to 1 range.

NOW YOU CAN HAVE all the advantages of instant speed control on all your machines at very low cost and without installing intricate and expensive mechanisms. You can increase production by setting operating speeds at exactly the right tempo for highest production. You can improve quality, change to new materials, all at the twist of a wrist.

All this is made possible by the *new Vari-Pitch* Automatic Sheave which changes pitch diameter and holds proper belt tension *automatically*. Today, ask your A-C Authorized Dealer or Sales Office to give you complete facts and figures on how the new *Vari-Pitch* Automatic Sheave can save money in your operations. Or write for Bulletin 20B7223. A-2837

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Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
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by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

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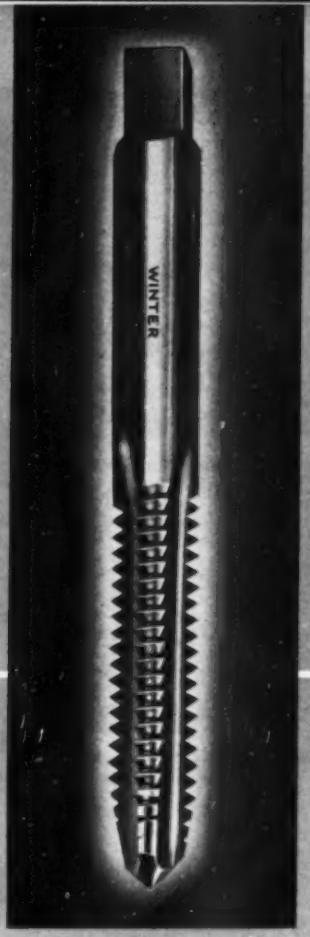
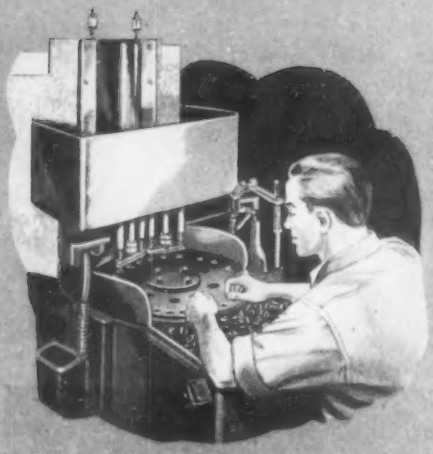




WINTER TAPS IN ACTION

WINTER STANDARD MACHINE SCREW TAPS are used in place of fractional size hand taps in sizes below ¼". They are available from No. 0 (0.60" diameter) to No. 14 (.242" diameter) in carbon steel. In high speed steel they are stocked as follows: cut thread and commercial ground from No. 3 to No. 14; precision ground from No. 0 to No. 14. Winter also offers machine screw series chip driver taps (spiral point) in sizes No. 3 to No. 14 for use in through holes and in thin materials, where breakage might occur with regular style taps. The complete Winter line includes chip driver, hand, nut, pipe, pulley, stove bolt, and tapper taps, and a full selection of dies.

ALWAYS AT YOUR SERVICE

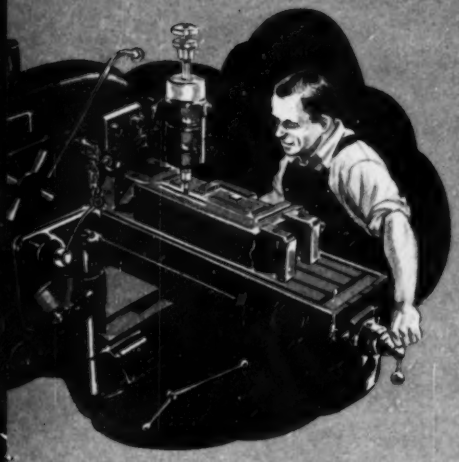
YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
Rochester, Michigan, U.S.A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH. U.S.

National

METAL CUTTING TOOLS ON THE JOB



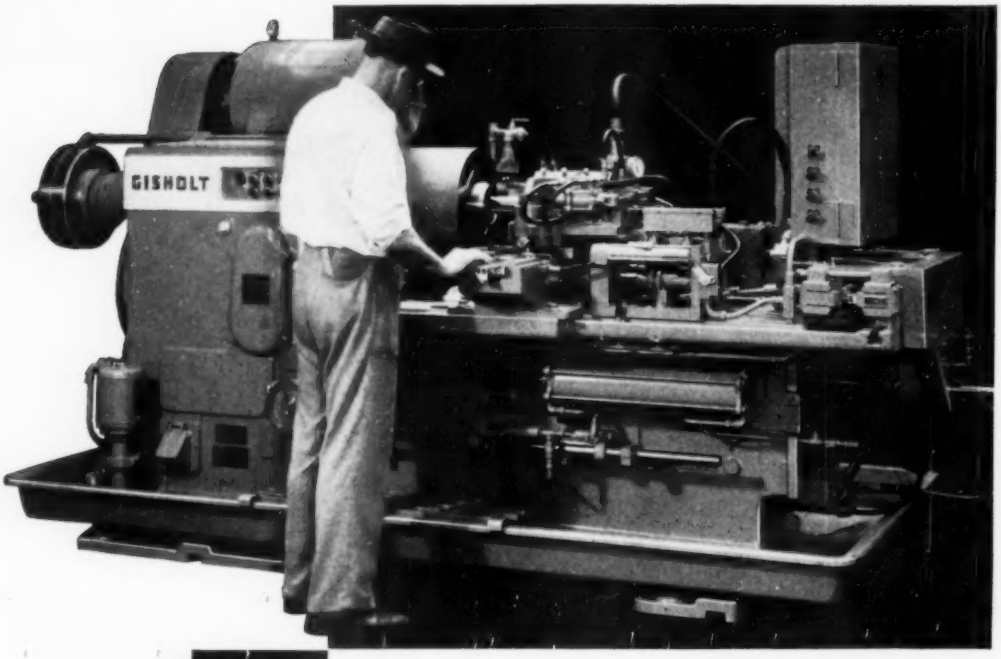
NATIONAL "HELEX" SINGLE END MILLS and DOUBLE END MILLS are recommended for milling slots, keyways and pockets, where arbor type milling cutters are unsuitable. They are designed with high helix angles of the cutting edges to promote smooth, efficient action. Because they are operated at high speeds, the danger of feed overload is lessened and breakage reduced. National also makes shell end mills, and taper and straight shank end mills. The complete National line of rotary metal cutting tools includes twist drills, reamers, counterbores, milling cutters, and hobs.

CALL YOUR DISTRIBUTOR

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL metal cutting tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco



HOW 8 SIMPLIMATICS

cut machine time 50%
cut man-hours 75%

The way you can slash costs with the Gisholt Simplimatic often surprises some of the most experienced production men.

Here's a big shop which found that 8 Simplimatics could take over the job done on 16 other machines. And it takes only 4 operators instead of 16 to turn out the volume of parts required.

Not the least in the cost picture is the machine itself. For the basic Simplimatic design permits you to individualize the machine to a high degree to solve many different problems. Thus, for many jobs you can have all the advantages of a special machine merely with special tooling. Yet it's all done on a Standard Simplimatic—at far lower cost.

The importance of lower costs these days makes it important for you to get all the facts about Simplimatic Automatic Lathes.

The GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

In producing these tool joint pins and boxes, the 8 Simplimatics work in pairs with fully automatic operation. one man can easily tend two machines.

Ask about the many different arrangements possible on the Standard Simplimatics with platen table, vertical head, etc.

GISHOLT MACHINE COMPANY, *Madison 10, Wisconsin*

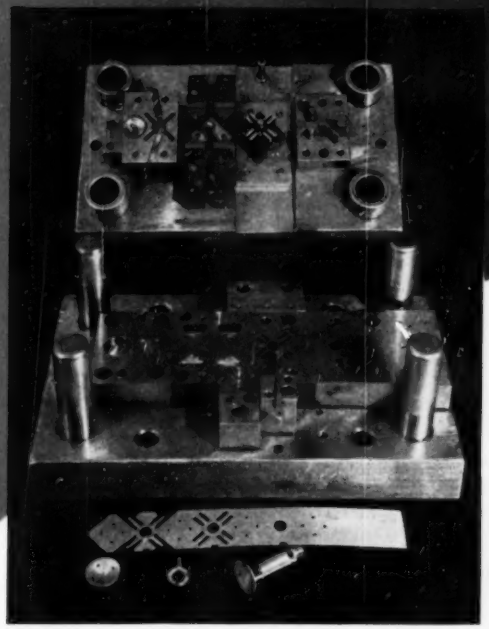
TURRET LATHES • AUTOMATIC LATHES • BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

A-H5

(5 PCT CHROME AIR-HARDENING)

A Toolroom Favorite on 5 counts

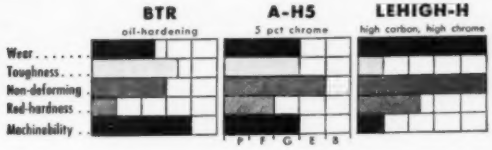
1. Air-hardening for safety.
2. Good wear-resistance.
3. Good toughness.
4. Excellent resistance to deformation.
5. Easy to machine.



"A-H5 always meets or exceeds our expectations . . ."
This comment comes from the chief engineer of Day and Night Division, Affiliated Gas Equipment, Inc., in Monrovia, California. This company makes a modern line of gas, space and water heaters for home and commercial uses. The die shown is used to pierce, blank and form burner canopies from .023S-in. stainless-steel strip. With all its parts made of A-H5 except the punches (they are Lehigh H), this progressive die is still going strong after producing several hundred thousand pieces, samples of which are shown in the foreground.

There's plenty of versatility in this 5 pct chrome, air-hardening tool steel. And it's economical, too, often replacing more expensive grades.

A-H5 is a general-purpose steel that fits in between the standard oil-hardening steels (such as Bethlehem's BTR) and the high-carbon, high-chrome tool steels like Lehigh H (another Bethlehem champion). Here's a quick comparison of the properties of all three:



(Poor, Fair, Good, Excellent, Best)

Use A-H5 for a variety of dies, punches, blanking tools, cold-forming dies, master tools, gages, and the like. Give it a thorough trial and you'll be sold on having it in your toolroom to stay. Let the nearest Bethlehem sales office or tool-steel distributor give you complete information. Quick delivery from our mill depot or local distributor's stock.

HEAT-TREATMENT OF A-H5

	C	Mn	Cr	Mo	V
Typical Analysis:	1.00	0.60	5.25	1.10	0.25

Annealing: Pack, heat to 1650 F, slow furnace-cool, Brinell 212 max
Preheating: 1200 to 1250 F, prior to hardening
Hardening: 1775 F, air-quench
Tempering: 350 to 400 F, Rockwell C 60 to 62

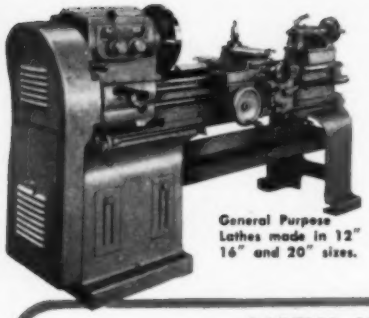
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Bethlehem SUPERSONIC TESTED Tool Steel



General Purpose Lathes made in 12" 16" and 20" sizes.

SEE YOUR *Sebastian* DISTRIBUTOR

for complete information on this value-leading, medium-priced lathe

Your Sebastian Distributor can show you why the Sebastian Lathe, with a powerful 8-speed geared head... Timken bearings on all headstock shafts... reverse in apron for feeds... 57 feed and thread changes... and many more modern design and construction features, represents today's outstanding buy in the medium-price lathe field. Ask your Distributor or write us for Catalog S-1 (Standard Lathes) and S-101 (Special Type Lathes—Gap, Clutch and Brake, etc.).

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KING MACHINE TOOL DIVISION

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Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

THE GREENFIELD STORY

of Service and Quality

Specials

IF all the "special" taps which "Greenfield" has made in the last 75 years were brought together, they would make a fantastic display of styles, shapes and sizes of threading tools.

File cases full of drawings and blueprints attest to the ingenuity and experience of "Greenfield" men in designing special taps for all kinds of applications. These files are a storehouse of knowledge for "Greenfield" engineers to use in meeting new problems or in duplicating previous orders even after a lapse of many years.

To handle orders that are not covered by the thousands of different "regular" taps listed in "Greenfield's" catalog, there is available not only a large staff of engineers but also a complete separate plant just for making "specials". Fast delivery and low cost on "specials" is convincing testimony to "Greenfield's" tap-making ability.

GTD

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

and

GEO MET RIC

THE GEOMETRIC TOOL CO.
New Haven 15, Connecticut

and

GTD AMPCO

AMPCO TWIST DRILL CORP. ★
Jackson, Michigan

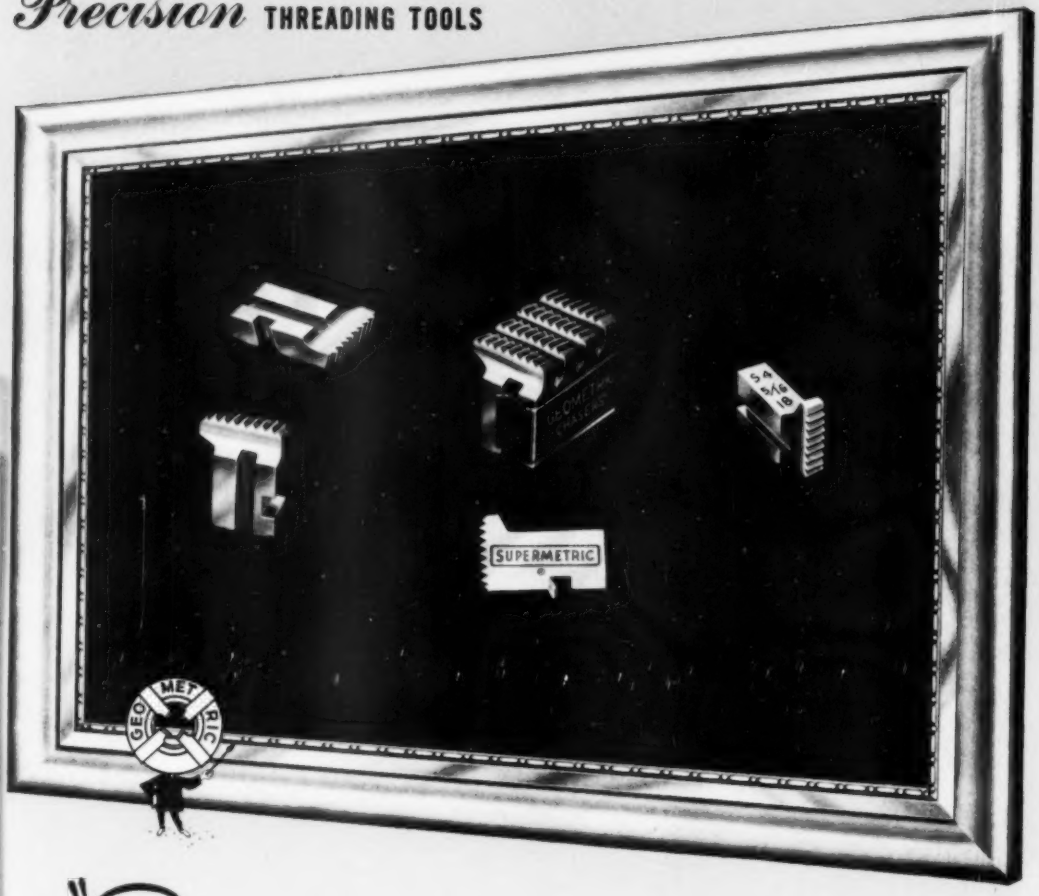
Divisions of Greenfield Tap and Die Corporation

GTD

GREENFIELD

Be Sure
Buy "Greenfield"

Precision THREADING TOOLS



"Supermetric"

Ground Thread Chasers.... Superior Finish!

Newest development in chasers, with the threads, keyways, cam lug slots and other surfaces finished to a high degree of precision and smoothness.

★ ★

NOW . . . Available for 9/16" Styles D, DS and DJ . . . in addition to 5/16" Styles DS and DJ Geometric Die Heads.

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GEOMETRIC also makes a complete line of Rotary and Stationary Self Opening . . . and Solid Adjustable Die Heads—Collapsing . . . and Solid Adjustable Taps—and GEOMETRIC Chasers.

"Be Sure ... Buy Geometric"

THE

GEOMETRIC

TOOL COMPANY, NEW HAVEN 15, CONNECTICUT

GTD

GTD AMPCO

NIAGARA

Announces New, Improved Circle Shears

FOR CUTTING CIRCULAR BLANKS, DISCS OR CIRCULAR ARCS OF 20 GAUGE SHEET STEEL IN CIRCLES UP TO 48" DIAMETER

NEW SAFETY - Gears are completely enclosed within housing.

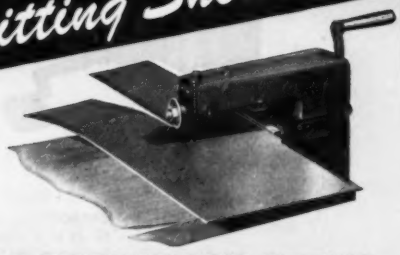
EASY OPERATION - Hobbed steel gears are smooth running. Quick acting center clamp holds the blank. Unmarked sheets can be quickly centered by adjustable swinging gauge. Graduations on bed show approximate diameter of circle.

NEW CUTTING HEAD - Box section design provides strength to maintain cutting and clearance angles for clean accurate work. Cutters and shafts are adjustable. Cutting head can also be used for slitting.

Niagara Circle Shear with rigid electrically welded stand.

Ideal for bench mounting.

and New Rotary Slitting Shears



FOR STRAIGHT LINE CUTTING, SLITTING AND TRIMMING

This is the lowest cost type of machine for slitting long sheets. Patented slitting gauge which is always parallel with the cutters controls the width of strip up to 9". Gauging surface is replaceable at low cost.

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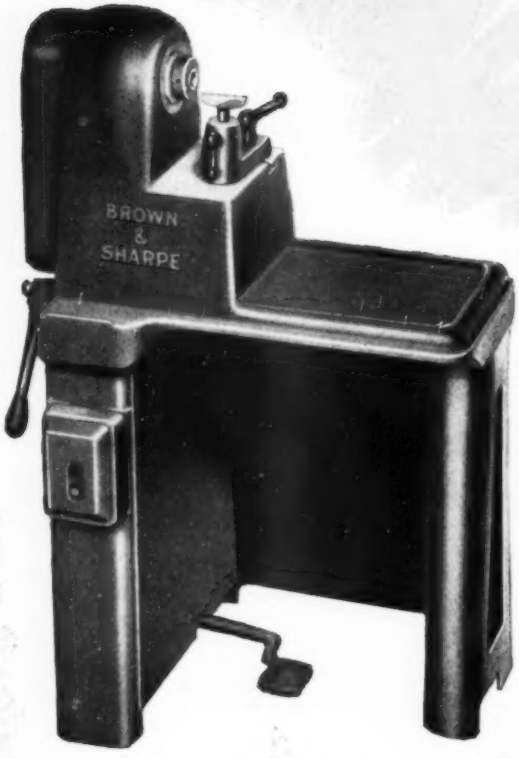
NIAGARA MACHINE & TOOL WORKS · BUFFALO 11, N. Y.
DISTRICT OFFICES: DETROIT · CLEVELAND · NEW YORK

NEW Polishing and Finishing Machine



CAPACITY . . . spindle takes collets for up to 1" diameter stock. Swing over bed 9¾" diameter; over rest, 7¾" diameter.

BROWN &

Here's 3-way improvement for screw machine department

- ***Faster Burring***
- ***Faster Polishing***
- ***Faster Filing***

A NEW MACHINE FOR EFFICIENT POLISHING AND FINISHING OF SMALL PARTS

This new addition to the Brown & Sharpe line has three special features that make it extremely advantageous for general all-around polishing and finishing of small parts.

1. A compact, completely self-contained design that streamlines operations. It permits operator to work easily and comfortably when sitting or standing. Foot pedal control of collet and brake leaves operator's hands free to load, perform necessary operations and remove work.

2. Three spindle speeds... up to 4500 R.P.M. ... make it unusually flexible and versatile ... suitable for a wide range of materials and operations.

3. Only the spindle is started and stopped for inserting and removing work—reducing inertia, wear, and motor heating. Constant speed motor runs continuously with V-belt drive released by the foot pedal.

Here's an opportunity to round out the efficiency of your screw machine department with only a modest investment. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

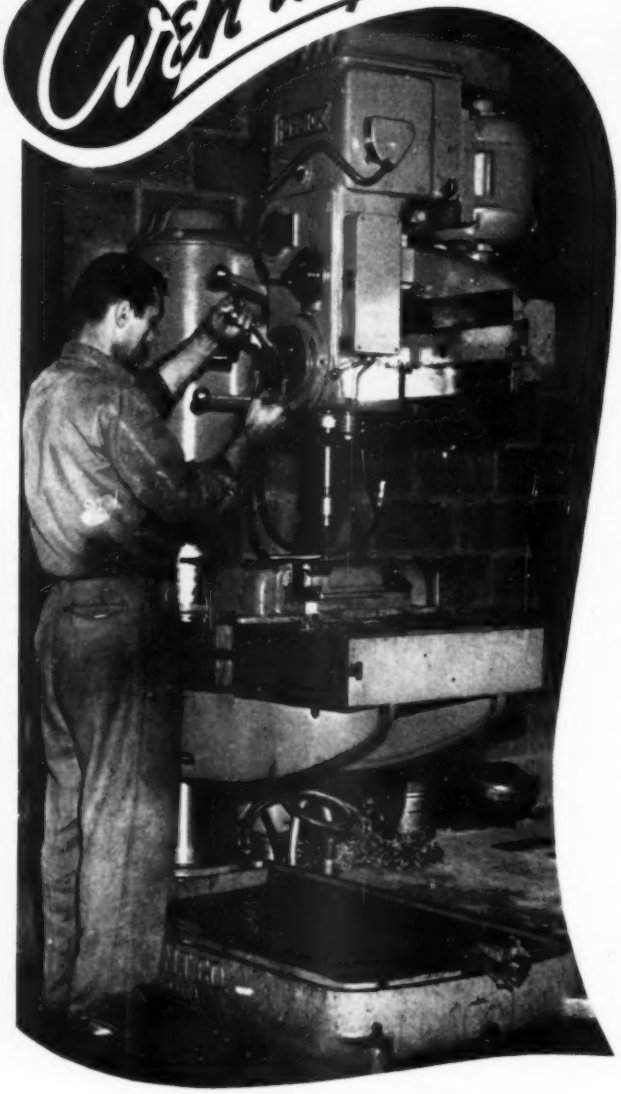
QUICK FACTS ON CONVENIENT FEATURES

1. Spindle driven by 3 step V-belt cone pulley enclosed by guard. Spindle is mounted on ball bearings. **2.** Spindle nose is threaded for chuck or other workholding device. **3.** Readily adjusted tool rest for burring, hand shaving, etc. **4.** Convenient work tray provides ample space for work pieces. **5.** Knee space permits sitting comfortably at work. **6.** Convenient start-stop switch for driving motor. **7.** Spindle speeds quickly changed through V-belt and cone pulleys. **8.** Built to typical Brown & Sharpe quality standards that assure extra years of productive service.

SHARPE B·S

Even in paper mills there's a need for the

FOSDICK *Sensitive* RADIAL



● In all types of industry there are small holes required in various kinds of metal parts. For instance the job shown — this Fosdick Sensitive Radial is installed in the machine shop of a well known paper manufacturer.

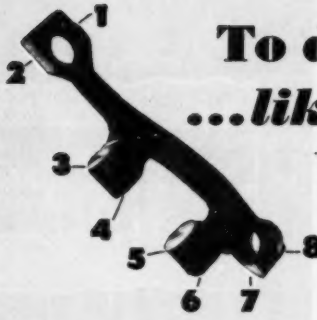
The view shown is a typical Sensitive Radial installation and indicative of the wide application of this relatively new type of drill for sensitive drilling.

Note the arm at fixed height—adjustable table enabling operator to set table at proper position for every job —both table and arm swing in an arc of 360°. This design permits the table to be swung out of the way and tall jobs to be mounted on the conventional radial type base.

Because of its unique design and moderate price the Fosdick Sensitive Radial is rapidly finding a place throughout shops all over the country.

If you have jobs requiring holes up to 1½ inch diameter it will pay you to investigate this Fosdick Sensitive Radial. Contact a nearby representative or write for the full descriptive bulletin Fosdick Sensitive Radial S.R.A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO



To do a BROACHING JOB ...like this You've got to have the "GUTS"!

Pardon our slang,
but this material was really tough: chrome vanadium steel, heat treated to Brinell 320.

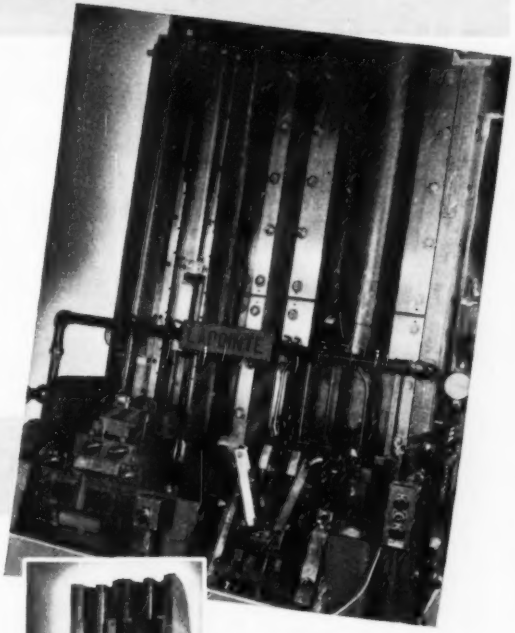
The part is a Front Suspension Spindle Support, newly designed by one of the world's largest automobile manufacturers. A pair (right and left) are needed for every car, so, in addition to the requirement of accuracy in machining, *production speed is a "must"!*

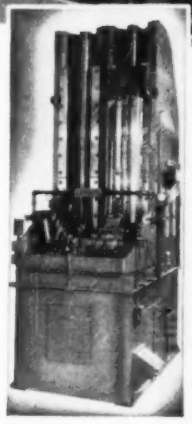
A STANDARD LAPOINTE DOUBLE RAM VERTICAL BROACHING MACHINE

with special holding fixtures, *completely machines all 8 surfaces* and at 80% efficiency delivers *288 finished pieces per hour.*

Obviously you need *mass* to get such performance . . . and these machines have it! Intelligent engineering, embodying *mass where it means most,* is responsible for

complete absence of vibration
at a cutting speed of 42 feet per minute,
and exceptional tool life





A simple but rugged automatic tipdown holding fixture, with automatic clamping, provides *fatigue-less operation* on a 20-second cycle.

A new folder is available, describing our Double Ram Vertical Broaching Machines. Send for Bulletin DRV-2.

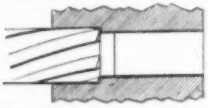
THE *Lapointe* MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory • Edgware • Middlesex • England

HUDSON LAPOINTE MASS.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

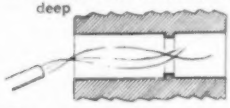
THE OLD WAY

1. Drill 25.5 m.m. (1.004") hole full length

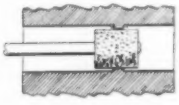


2. Machine bore to 1.761", .9975" deep

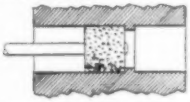
3. Rechuck and machine opposite end of bore to 1.761", 1.9355" deep



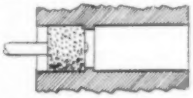
4. Heat treat and quench



5. Grind .00355" off shoulder inside diameter



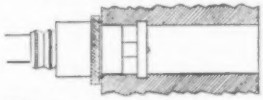
6. Grind .0025" off bore, one end and .0025" off side of shoulder



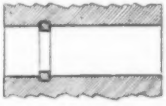
7. Rechuck and grind .0025" off bore, opposite end and .0025" off side of shoulder

RELIANCE WAY

1. *Drill 1.811" (30 M.M.) hole, full length



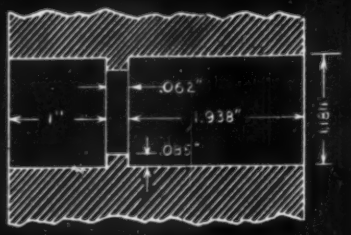
2. Recess groove .074" wide and .040" deep in bore, 1" from end



3. Snap Reliance Ring in groove

* For some applications, seamless tubing may be used, eliminating all drilling

No heat treating is normally required as ring is already hardened. No danger of warpage. If bore must be hardened, it may be ground in one pass after heat treating.



HOW RELIANCE RINGS

(AND GROOVING TOOL)

Slash the Cost of internal shoulders

The drawing and comparison chart above show how Reliance Rings and the Reliance Grooving Tool slashed the cost of internal shoulders on a typical application, eliminating four operations — saving time and money.

Reliance Snap Rings are available in carbon, alloy, stainless steel or non-ferrous metal to specified physicals, cross sections and diameters—ends shaped to meet any requirement. Reliance Rings offer opportunities for cost reduction, time saving and product improvement limited only by human ingenuity in finding new uses for them.

Reliance engineers will be pleased to study your prints or parts and lend the benefit of their experience in considering possible application of Reliance Rings to your product. Or, if you prefer, a competent representative will call to discuss the possibilities with you. Write, phone or wire your nearest Reliance Sales Office.

RELIANCE RINGS

RELIANCE DIVISION, MASSILLON, OHIO

Sales Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal

EATON

EATON MANUFACTURING COMPANY

Single-purpose machines cut costs

Special automatic drilling and tapping machines save money with high production

Dear Sir:

In an hour one Kingsbury with one operator performs 5,184 operations on lock cylinders. In one hour the other Kingsbury with one operator performs 5,824 operations on gear housings. (Both at 80% efficiency.)

ACCURATE, UNIFORM PARTS

All operations are complete in one chucking. Bushings guide the drills. Fixtures are duplicates, jig bored to minimum toolroom tolerances. Spindles are located to exact indicator readings and run in precision ball bearings. Automatic cycles make every part uniform.

UNIT COSTS IN PENNIES

Man and machine cost 8/10c for all 9 operations on each lock cylinder. They cost 1-9/10c for all 16 operations on each gear housing. These costs are based on 1) the national average wage rate, 2) 80% efficiency and 3) paying off the full cost of the machine and tooling in the first 6000 hours of operation. (No power or overhead.)

SHORT PAY-OFF PERIOD

Each machine will run many times longer than 6000 hours. We used that basis because most firms want their money back in 1 to 3 years. If the pay-off period were longer, they would try other methods.

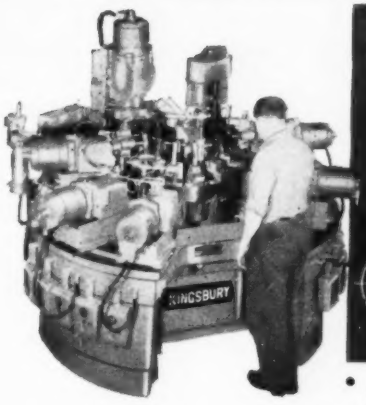
CHECK COSTS FROM PROPOSALS

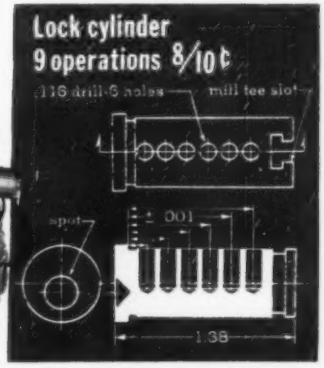
We prepare many proposals on tooled machines so that high production plants can compare their costs. Many never result in orders, of course, a fact that our general manager accepts philosophically. "At least they are fun to work out," he says, pausing for a reaction.

So don't hesitate to ask for a proposal. Send a print to our Mr. L. A. Carll and tell him the operations and hourly output you need. And ask him for free bulletins that show 40 setups.

Sincerely,

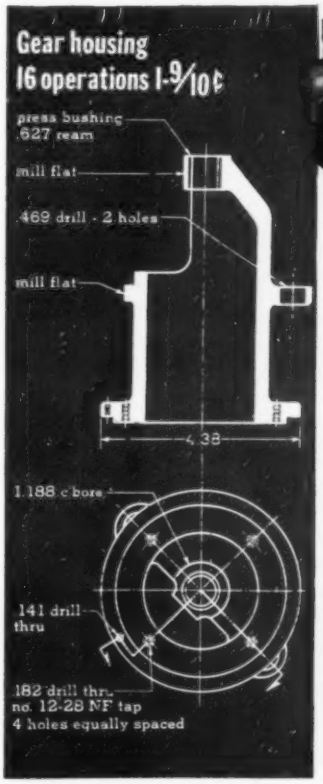
Kingsbury Machine Tool Corp.
20 Laurel St., Keene, N. H.

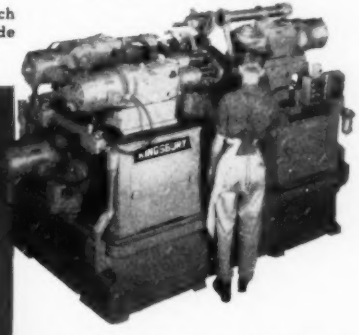




720 PARTS AN HOUR GROSS. This horizontal indexing Kingsbury drills the 6 pin holes, mills the T-slot and spots the dubb hole in one chucking.

- Six units drill the pin holes. Each fixture has a bushing plate to guide the drills.
- Two units mill the T-slot — one the throat and one the head space.
- An underneath unit spots the dubb hole. A bushing guides the drill.
- A hand plunger ejects each finished part from its fixture.





455 PARTS AN HOUR GROSS. This vertical indexing Kingsbury enables 8 automatic units to operate on opposite faces of the part in the same chucking.

- An air-operated mechanism with chute feed inserts the bushing at the first working station on the right. A standard unit reams the bushing to size at the fifth station.
- The 1.188 counterbore is piloted. Its spindle has a 7-inch stroke to reach deep inside the part.
- Standard drilling units with standard milling heads mill the flats.
- Standard units with 2- or 4-spindle auxiliary heads operate on the two .469 and four tapped holes.

KINGSBURY

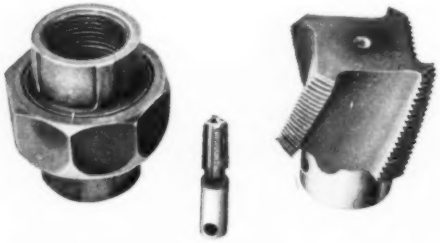
AUTOMATIC DRILLING
AND TAPPING MACHINES
for Low-Cost High Production

look what can happen when you

refuse to be satisfied with "EXPECTED PRODUCTION"

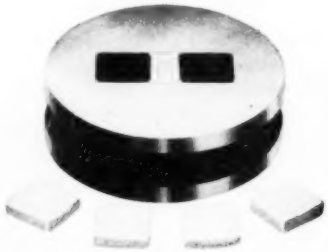
from tools and dies . . .

Many tooling men have said: " . . . Our tools are running along O.K.—things are satisfactory". Yet, after these men discovered a more foolproof way to select the proper steel for the job, they wondered why they were ever satisfied with "average" tool and die performance. And look at the results they are enjoying:



Operators Objected to the Change . . . But Now They Are Convinced!

Everyone claimed these taps for threading cold forge unions were running along "O.K.". But the T.R.F. wasn't convinced. He used the Carpenter Matched Set Method to pick the one steel best suited for the job—SOLAR (Water-Tough). Now production is up 350%—and today the operators *insist* on taps made from SOLAR! It can happen in your plant—if you *refuse* to be satisfied with "Expected Production".



Production Was Considered "Satisfactory" . . . But That Didn't Stop This Toolmaker:

This die preforms tablets from Bakelite powder on a preform press. Even though the highly abrasive plastic created a wear problem, production was considered "satisfactory". Yet, in a desire to investigate every possibility for reducing costs and boosting output, the toolmaker changed to a steel in the Carpenter Matched Set. Now, with K-W (Water-Wear), the die lasts twice as long as those previously considered "satisfactory"—and 8 to 10 hours are saved between grinds!

Existing production records *are* being broken daily, tools and dies *are* producing more, giving less trouble. And tooling men who are no longer satisfied with "Expected Production" are cashing-in on lower costs. The Carpenter Matched Set Method has *proved* it can help you do the same. Best of all, it is amazingly easy to use because it is simplification itself! It simplifies selection, heat treatment, inventories—practically all toolmaking operations. You'll never know the job it can do unless you try it. Prove it to yourself—it's easy. Simply pick out a job—put the Matched Set Method to work—then compare results!

Export Department, 233 Broadway, New York 7, N. Y. "CARSTEELCO"

—And you can get IMMEDIATE DELIVERY from LARGE STOCKS!

Carpenter

MATCHED

TOOL & DIE STEELS

Offices and Warehouses in Principal Cities Throughout the U.S.A. and Canada

THE CARPENTER STEEL COMPANY, 109 W. Bern St., Reading, Pa.

for Amazing Performance and Extra Tool Life

ELECTROLIZING is a proven process which increases tool life by fortifying the cutting edges with surfaces so smooth that friction is reduced . . . and chip-weld virtually eliminated. Tools hold size longer.

The MORSE ELECTROLIZING process obtains this extra tool life by two steps: (1) A treatment which raises the fatigue-point of the tool . . . and then, (2) A process, by which a new, hard . . . yet ductile alloy, .00003" to .00005" thick, is uniformly deposited on the cutting edges.

This proven ELECTROLIZING process . . . now a MORSE *exclusive* . . . means double . . . triple . . . or even greater tool life, for a slightly increased cost over that of regular MORSE Tools which can still be obtained. Specify MORSE ELECTROLIZED Taps, Dies, Drills, Reamers, Cutters and End Mills! Find out for yourself the amazing facts of ELECTROLIZED Performance, already proven to many large users of cutting tools. Your Morse-Franchised Distributor's salesman can help you with ALL your cutting tool requirements. Talk with him . . . for, now, more than ever, he's the top man to supply your cutting tool needs. Remember! YOU can *now* specify "MORSE ELECTROLIZED."

SOLD EXCLUSIVELY THROUGH MORSE-FRANCHISED DISTRIBUTORS

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

This is another of the "HUNDREDS OF JOBS" which can be done only on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model 8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG

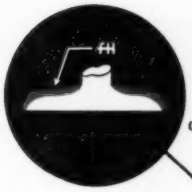
MARVEL Metal Cutting SAWS
Better Machines—Better Blades

These exclusive MARVEL Features made this job easy.

1. **Large, T-slotted work table.**
2. **Blade feeds into work vertically; work always stationary.**
3. **Power-pressure feed.**
4. **Automatic Blade tension.**
5. **Built-in coolant system.**
6. **Large capacity.**

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

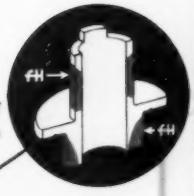


oil pump valve

clutch adjusting nut

drive shaft

torque converter hub



fh the new symbol

for faster, more economical surface hardening

torque converter internal cam

ring gear

On your part prints or assembly drawings . . . wherever you want to specify hardness values and patterns **and be sure of getting them** . . . write "fh." It's the new symbol for "flamatic hardened"—the term that made hot news at the last two Metal Shows with starter ring gears and torque transmission cams held to closer specs at higher speeds than ever before.

At this year's Metal Show, flamatic hardening, with electronic control, does it again, demonstrating in actual production how "fh" puts the right hardness in the right place in pipe wrench jaws—and opens up a promising new field of applications. If you missed the Flamatic demonstration at the Metal Show, **by all means** write for the new booklet on how Flamatic hardening makes better products **cost less.**

Thousands witnessed **the demonstration of Flamatic Selective Surface Hardening** applied to wrench jaws, opening a new field of applications to non-symmetrical parts.

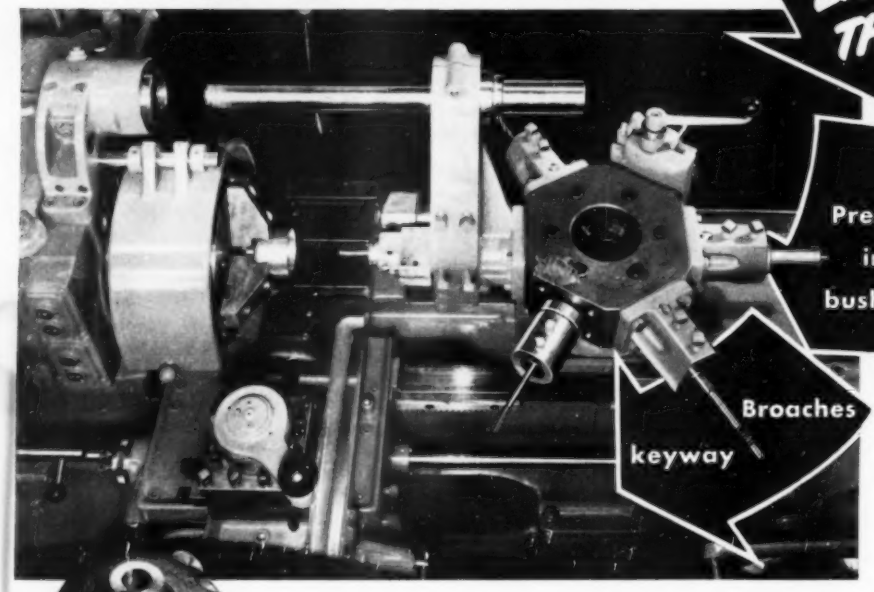
hook roller

flamatic

THE CINCINNATI MILLING MACHINE CO.

Cincinnati 9, Ohio, U.S.A. • CINCINNATI

Turret Lathe Ideas—



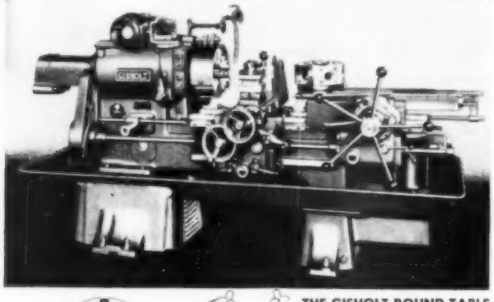
Save you time and money... INCREASE PRODUCTION!

Darned clever, these production men!

Note the use of this Gisholt No. 3 Ram Type Turret Lathe. In addition to handling all the typical drilling, boring, facing and reaming operations on the inside of a small motor housing, this turret lathe is used to:

Broach the keyway
Press in a bushing
Finish machine in place

Gisholt No. 3 Universal Ram Type Turret Lathe



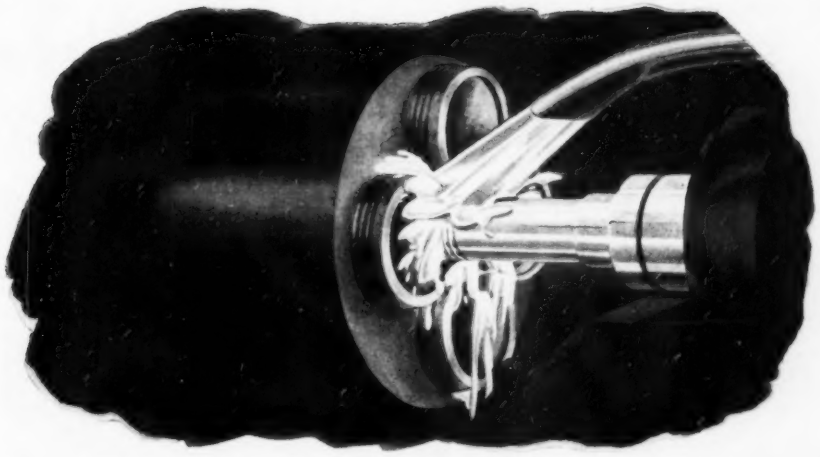
The entire operation on these parts takes only 1.37 minutes. Figure the time and cost saved in not having to transfer parts to other machines—or other departments—for these operations.

Don't overlook the many ways you can get greater production from your turret lathes. Gisholt engineers have all kinds of money-saving ideas to help you with your problems. Ask one to call. Or write us.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wis.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



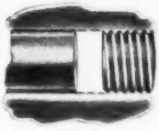
THREADING AND TAPPING ALCOA ALUMINUM in Screw Machines

You save stock and machine time by following the simple procedures for threading and tapping Alcoa Aluminum Screw Machine Stock.

Seizing tendencies will be minimized if the threads are smoothly cut. Where possible, use a die head with adjustable chasers rather than a solid die. Spiral taps are preferred to straight fluted taps, especially for deep-hole tapping operations.

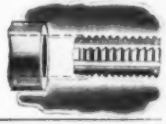
Two sections of the free booklet "Alcoa Aluminum in Automatic Screw Machines" are devoted to threading and tapping. The entire book is packed with technical information gained from Alcoa's 60 years of aluminum experience. Ask for your copy at your nearby Alcoa sales office or write ALUMINUM COMPANY OF AMERICA, 1709K Gulf Bldg., Pittsburgh 19, Pa.

GOOD MACHINING PRACTICES SAVE METAL



METAL REMOVAL—Both dies and taps remove large amounts of metal in proportion to their size. To reduce the load, have the blank or hole diameter of the part to be threaded near the tolerance limit favoring the removal of the least metal.

ALIGNMENT—Taps and dies must be accurately aligned with the part to be threaded. This is extremely important if threads are to be true.



TOP RAKE ANGLES—Both taps and dies for aluminum work should have a top rake angle ground on the leading edge of the tool. Tap flutes should be highly polished. The backs of tap lands should have little or no top rake to prevent shaving the threads as the tap is removed.

LIP HOOKS—Dies and taps will cut the softer alloys better if a hook is ground along the leading edge of the lands to the third full thread, at about 5° to the axis of the tap or chaser. This provides more rake at the initial cutting edge.

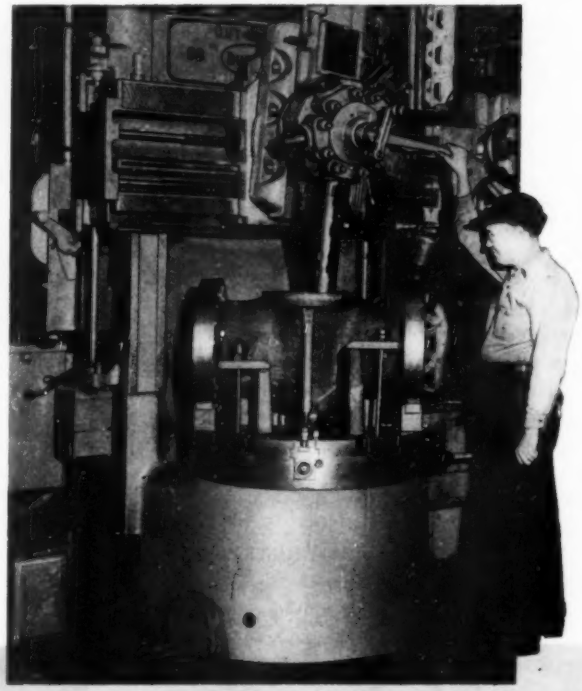
ALCOA ALUMINUM

INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
ELECTRICAL CONDUCTORS • SCREW MACHINE PRODUCTS • FABRICATED PRODUCTS • FASTENERS • FOIL • ALUMINUM PIGMENTS • MAGNESIUM PRODUCTS

the BULLARD
CUT MASTER
VERTICAL TURRET LATHE

BULLARD *Saves 2 Ways*

- 33-⅓% SAVED ON 3 OPERATIONS
- GRINDING OPERATION ELIMINATED



Bullard 36 inch Cut Master. Rigid enough to swing this large valve. Operations are taper bore, face flange and counterbore. 33-1/3 per cent time savings on three operations and because of the beautifully smooth finish, a grinding operation was eliminated.

Manufacturing Economies

This specifically illustrates the Bullard Cut Master adaptability to problem jobs. Naturally cumulative small savings in time, due to rapid and positive speed selection, limit stops for simplified dimensional duplication, centralized operating controls and high rate of rapid traversing add up to large savings on any work.

Also the rugged construction with large Timkin spindle bearings permits heavy feeds, thereby cutting time of operations. Rigid construction and screw feeds assure a high degree of machining accuracy resulting in minimum expense for spoiled work. All in all — Use Bullards for manufacturing Economies. Write for Cut Master Catalog XY-CVTL.

The Bullard Company, Bridgeport 2, Connecticut.

LOOK AT THIS PRESS

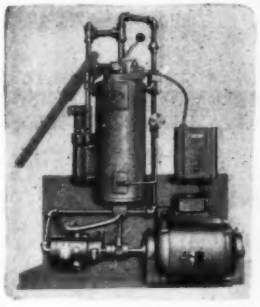
It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation . . . relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24″—31″—36″—42″ respectively. Available in special width up to 72″ at small additional cost.*Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. Presses available for either vertical or horizontal operation. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.

READ THESE "SPECS":

CYLINDERS: *Standard Models* furnished with 6" bore, 7½" stroke—spring return type; also 5" bore, 7½" stroke—spring return type. Above presses are *standard.* Following can be furnished at additional cost: Double Acting, 6" bore, 7" stroke; 6" bore, 11" stroke; 5" bore, 7" stroke; 5" bore, 11" stroke. Special long stroke cylinders also available, up to 48" in length, for incorporation in suitable press frames of our make.

PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

Presses include V blocks, Gauge, Motor Controls, Pressure Regulator, etc., complete and ready to attach to electrical source.



MODERNIZE AND MOTORIZE YOUR PRESENT KRW PRESS with one of these compact motor drive units. They come complete ready to connect to your press. Require very little extra floor space. Write for conversion unit prices, giving the capacity and serial number of your press.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious . . . blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging. KRW Engineers are daily developing other uses. If you have only a vague idea of how these presses might be used in your plant, let us have it in a rough form. We'll do the rest.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra. **Subject to change without notice.*

MAIL THIS COUPON

It will bring you all the money-saving facts about these low cost, high production hydraulic presses. Now is the time to get ready for the highly competitive days ahead.

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please send me complete information on KRW Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton ☐ 75-ton presses

☐ motor drive conversion unit ☐ Press Cap.

Serial No. .....

Name .....

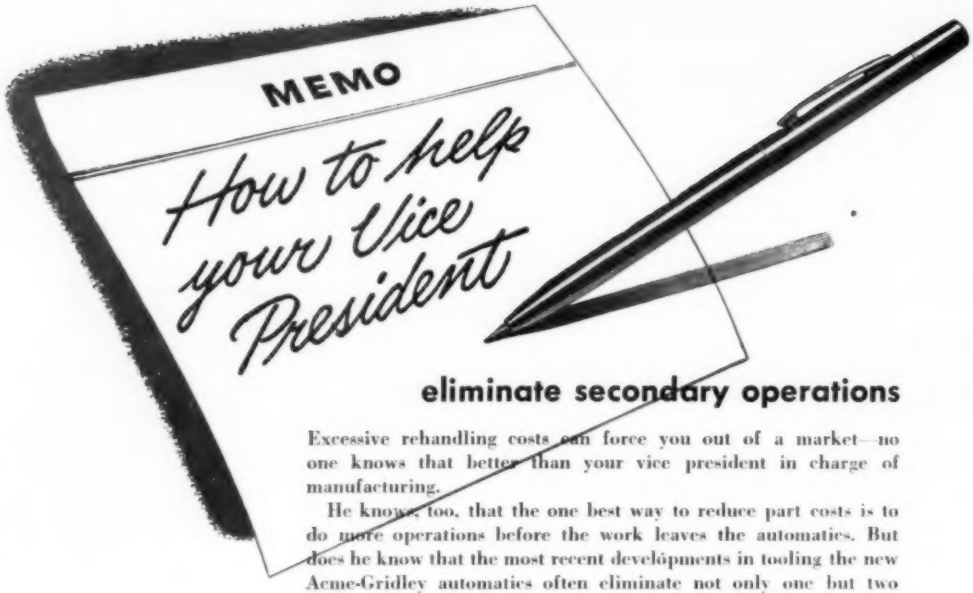
Address .....

City and Zone ..... *State* .....

11

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.



eliminate secondary operations

Excessive rehandling costs can force you out of a market—no one knows that better than your vice president in charge of manufacturing.

He knows, too, that the one best way to reduce part costs is to do more operations before the work leaves the automatics. But does he know that the most recent developments in tooling the new Acme-Gridley automatics often eliminate not only one but two and three rehandlings?

A few pertinent case studies showing how other manufacturers have cut their piece costs substantially—by reducing handling time, machine overhead and floor space—may remind him what the new Acme-Gridleys can do for you. Here's a typical example: we'll gladly give you more. No obligation, of course.

CUT THIS OUT FOR USE WHEN YOUR VICE PRESIDENT WANTS PROOF

AN ACME-GRIDLEY CERTIFIED CASE STUDY

THIS IS WHAT HAPPENED:

PART TURNED—Bicycle Pedal Shaft

SIZE—¾" dia. x 4⅜"

MATERIAL—B-1112 Steel

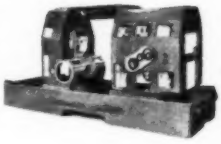
MACHINE—1¼" RA 6 Spindle Acme-Gridley Bar Automatic

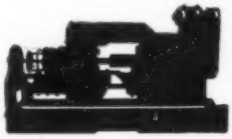
OPERATIONS—13, including shave large thread diameter, and roll thread, mill flats or large diameter, die cut thread and mill keyway on small end

MACHINING TIME—15 seconds, complete

AND HERE'S ONE IMPORTANT REASON:

The rigid, box-type, balanced frame of an Acme-Gridley Automatic resists vibration, *holds* precision on heavy cuts, and provides ample room for many independently operated power-driven auxiliaries. Construction is strong throughout, from the heavily-ribbed pan to the rigid one-piece top brace. Gear-box and headstock are cross-walled, with reinforced shaft bosses. All fitted frame surfaces are ground, aligned, bolted and doweled, to form a sturdy, vibration-resisting foundation that permits accurate, high-speed operation.





THE NATIONAL ACME COMPANY
170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8-spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

Here's the steel to improve automatic screw machine operation

U·S·S FREE-MACHINING **MX** BAR STOCK

HAS UP TO 20% GREATER MACHINABILITY . . . DEFORMS READILY

U·S·S FREE-MACHINING **MX** BAR STOCK

INSURES FASTER PRODUCTION . . . INCREASES OUTPUT

U·S·S FREE-MACHINING **MX** BAR STOCK

IMPROVES FINISH . . . REDUCES REJECTS . . . LENGTHENS TOOL LIFE

WHY not find out how this new free-cutting bar stock works on your equipment? It may be just what you need to improve your product quality or to cut your costs. You can obtain U·S·S Free-machining MX in cold finished bars from your regular supplier. In hot-rolled bars, MX is available through our nearest district sales office. A qualified metallurgical representative will gladly discuss its possibilities with you.

USS

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH AND CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

9-1488

UNITED STATES STEEL

You will be amazed at the performance

of the **REDESIGNED**

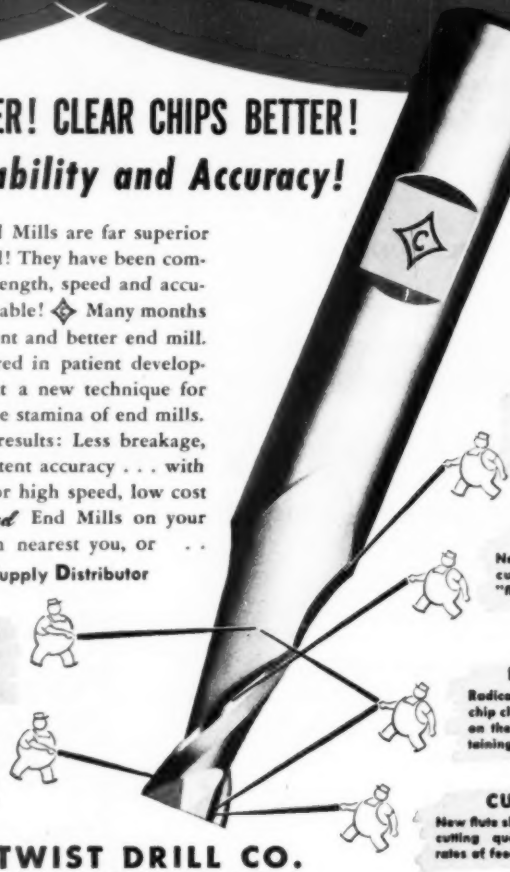
Cleveland END MILLS

STRONGER! CUT FASTER! CLEAR CHIPS BETTER!

Much Greater Durability and Accuracy!

The new *Cleveland* End Mills are far superior to any you have ever used! They have been completely redesigned to give you strength, speed and accuracy that were never before obtainable! Many months ago we set out to design a different and better end mill. Neither time nor effort was spared in patient development work. We even worked out a new technique for testing the cutting qualities and the stamina of end mills. Users are enthusiastic about the results: Less breakage, many more cuts per grind, consistent accuracy . . . with up to *50% increase in feed.* For high speed, low cost operation, use the new *Cleveland* End Mills on your next job. Contact our Stockroom nearest you, or . .

Telephone your Industrial Supply Distributor



STRONGER
No sharp corners or points where localization of stresses might occur. Minimum amount of metal has been cut away.

MORE DURABLE
New-style clearance supports the cutting edge; assures against "flaking" or "chipping out."

LONGER LIFE
Radically new flute shape and chip clearing ability reduce wear on the cutting edge, thus maintaining consistent accuracy.

CUT FASTER
New flute shape gives maximum cutting qualities at increased rates of feed.

CLEAR CHIPS BETTER
Redesigned flutes are machine polished. There are no pockets. Chips are free to move.

GREATER ACCURACY
New clearance and accurate machine polish of flutes result in closer control of size.

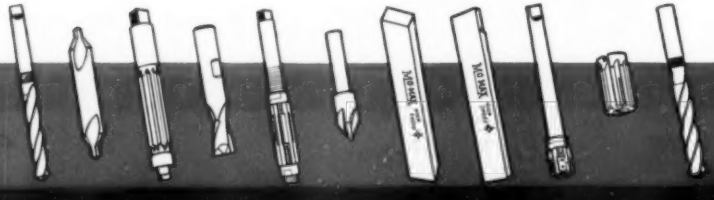
THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 11

E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

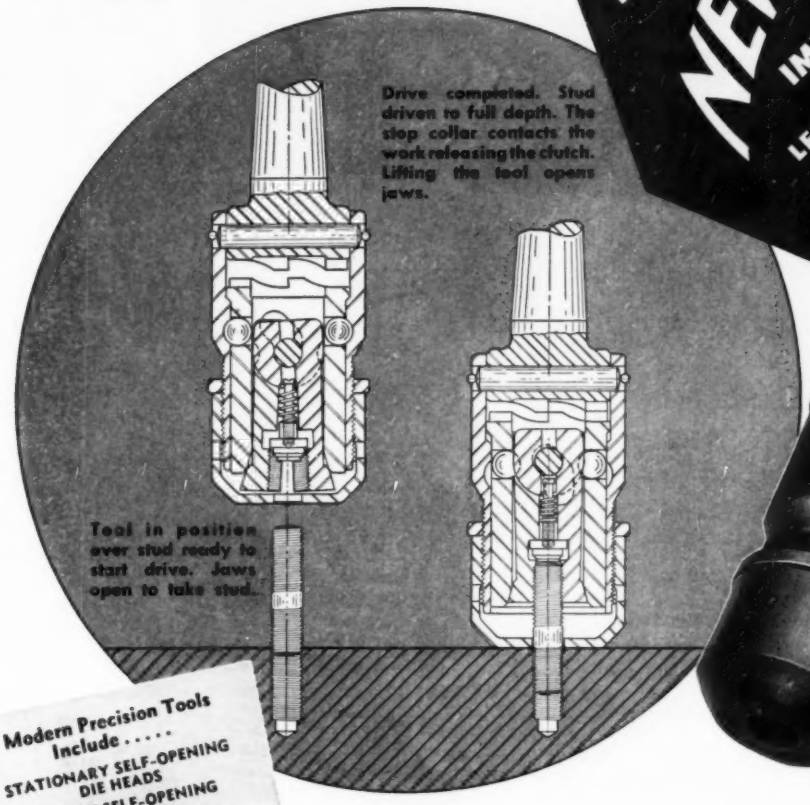


CLEVELAND

DISTRIBUTORS EVERYWHERE are ready to serve you!

MODERN
SELF-OPENING
STUD SETTERS

NEW
IMPROVED DESIGN
LESSENS COST OF STUD SETTING


Drive completed. Stud driven to full depth. The stop collar contacts the work releasing the clutch. Lifting the tool opens jaws.
Tool in position over stud ready to start drive. Jaws open to take stud.

MODERN STYLE H STUD SETTER

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Through improved design that insures longer life to the tool jaws and less down time for changes and repairs, this new Modern Style H Self-Opening Stud Setter provides the means to greater economy in stud setting. With this improved tool, it is possible to set more studs . . . in less time . . . at lower cost . . . with a minimum of thread mutilation . . . and with less wear to the tool itself.

Full information covering the advanced construction features and improved action of this new Modern Stud Setter as well as the economy possible through its adoption for your stud setting work, will be furnished immediately upon your request.

MODERN TOOL WORKS

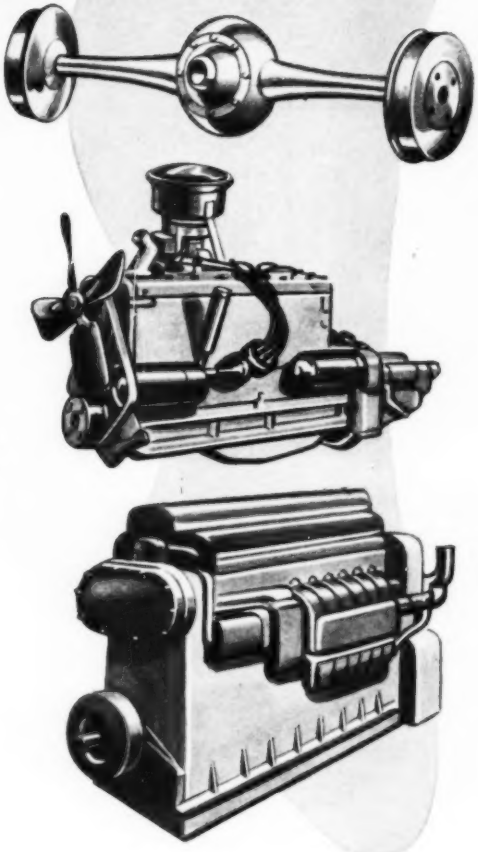
DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

PARCO LUBRITE

smooths the early life of friction surfaces



AIDS BREAK-IN

•

MINIMIZES SCUFFING AND SCORING

•

CONTRIBUTES TO LONG OPERATING LIFE

The first few hours of operation are crucial for friction surfaces. To protect the smooth surfaces and close fit of shafts, pistons, cylinders, gears and rods, leading manufacturers treat these parts with Parco Lubrite.

The Parco Lubrite coating, integral with the metal itself, is nonmetallic and oil absorbent. It holds lubricant, minimizes scoring and scuffing, aids greatly in the quick, smooth wearing-in of the surfaces.

The close, smooth seating, quickly attained by Parco Lubrite treated parts, contributes to the longer, more efficient life of assembly or engine.

ASK FOR DETAILS!

Get the full story of Parco Lubrite's advantages. Send for technical bulletin today!

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

PARKER

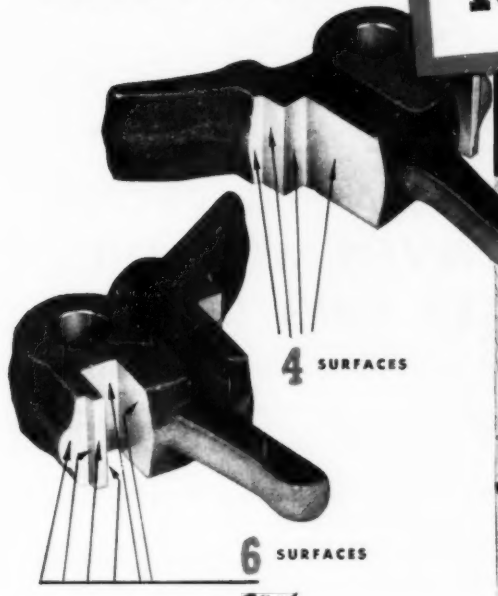
PARKER RUST PROOF COMPANY
196 East Milwaukee Ave.
Detroit 11, Michigan

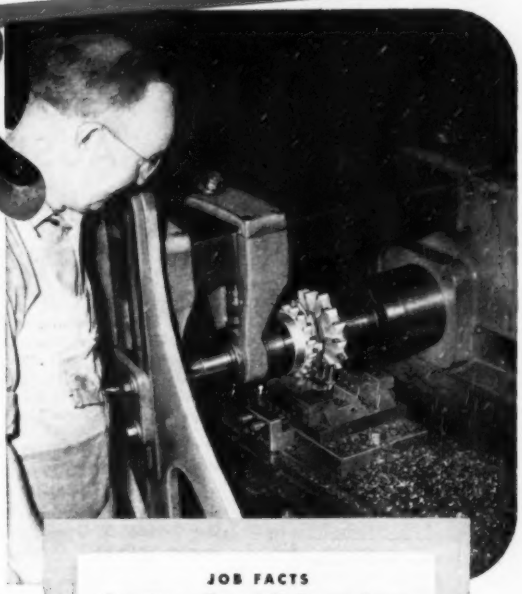
BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

GANG-MILL

10 SURFACES AT ONE TIME!

1500 PIECES PER SHARPENING





With

BARBER-COLMAN

CARBIDE-TIPPED GANG CUTTERS

A good way to beat today's high costs of production is to combine several operations into one. This job is a good example. 10 different dimensions are machined on tough steel forgings, 4 pieces per load, in 4 minutes, using Barber-Colman special carbide-tipped gang cutters.

Rigid workpiece and cutter mounting permits a fast feed of 11" per minute and 187 cutter r.p.m. — with no sacrifice in tool life. An average of 1500 parts are machined per gang sharpening.

Check your milling operations for possible combination cuts, and then let a Barber-Colman Cutter Engineer recommend the best tools for the job.

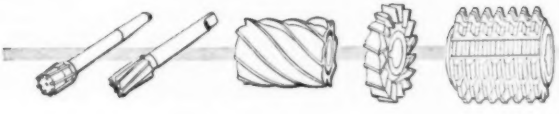
JOB FACTS

Operation — Gang-Mill Pressure Levers, 10 Surfaces
Material — SAE 4615 Forgings, 180 Br.
Cutters — B-C Job-Engineered Half-Side Mills and Full-Side Mills, Carbide-Tipped, Negative Rake
Feed — 11"/minute, climb cut
Speed — 187 RPM
Fl-to-Fl — 4 minutes per load
Tool Life — 1500 pieces per gang sharpening

METHODS ENGINEERS!
Get this Special File of typical performance on Job-Engineered Cutter Designs. Write for File No 4143.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 4143 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN

UNBRAKO

The Knurling SAVES TIME...

ASSURES A SLIP-PROOF GRIP, EVEN WITH OILY, GREASY FINGERS

There is a definite saving of assembly time when you use "UNBRAKO" Socket Head Cap Screws. The exclusive knurled heads perform triple duty: (1) the *knurling* provides a *sure*, slip-proof grip; (2) the *knurling* speeds assembly, because it enables the "UNBRAKO" to be screwed in faster and further with the fingers—handiest of all wrenches—before a "key" becomes necessary; (3) the *knurling* permits positive locking—a feature so often essential where there is excessive impact or vibration.

As always, the brand name "UNBRAKO" signifies *extra strength* and *precision manufacture to close tolerances.*

"UNBRAKO" *Knurled* Socket Head Cap Screws are available in both National Coarse and National Fine Thread Series in a full range of standard sizes. Other sizes to special order. Our "UNBRAKO" Catalog gives you further details—write for it and for the name of your nearest "UNBRAKO" Distributor.

Knurling of Socket Screws originated with "Unbrako" in 1934.

OTHER POPULAR "UNBRAKO" PRODUCTS

"UNBRAKO" *Knurled* Cup Point or *Knurled* Thread Self-Locking Socket Set Screws; "UNBRAKO" *precision-ground* Dowel Pins . . . of hardened alloy steel; "UNBRAKO" *fully-formed* Pressure Plugs . . . in either regular or "Dryseal" types.

SOCKET HEAD STRIPPER BOLT WITH KNURLED HEAD

Stripper Bolt or Shoulder Screw—precision ground for maximum accuracy.

SOCKET SET SCREW WITH PLAIN CUP POINT

For use where Self-Locking is not necessary, the "UNBRAKO" Socket Set Screw with *plain cup point* has proved highly satisfactory. Sizes available from # 4 to 1½" diameter, in a full range of lengths.

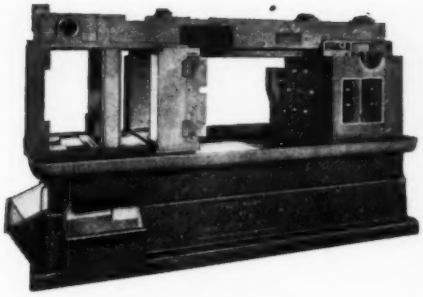
FLAT HEAD SOCKET CAP SCREW

The "UNBRAKO" Flat Head Socket Cap Screw is representative of the popular "UNBRAKO" Internal Wrenching feature . . . and of "UNBRAKO" *extra strength and precise close tolerances.* Available in sizes from ¼" to 3" diameter, in a full range of lengths.

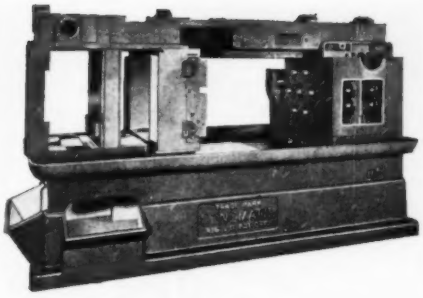
SPS STANDARD PRESSED STEEL CO.

BOX 4 JENKINTOWN, PENNSYLVANIA

"Serving Industry continuously since 1903 through Industrial Distributors"



2⅝" 6-Spindle
CONOMATIC
FRAME



Heavy, Massive

ARE YOU

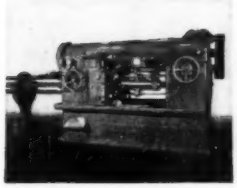
Weight — 12,446 pounds
Floor Length — 127"
Floor Width — 50"
Height — 71 11/16"
Height of Base Support—34"
(Full information available)

SUBJECT TO WITHHOLDING?

The withholding of information regarding the facilities of machine tools would be unintentional. But the use of generalizations and approximations, instead of specifications, actually is withholding. Generalizations fail to establish the superiority of a machine's facility through terms which lack a definite basis of comparison. They leave an impression of doubt as to tangible substantiation.

There is nothing definite about a "roomy" tooling area; nothing specific about a "rugged" tool slide, and nothing comparative about a "massive" frame.

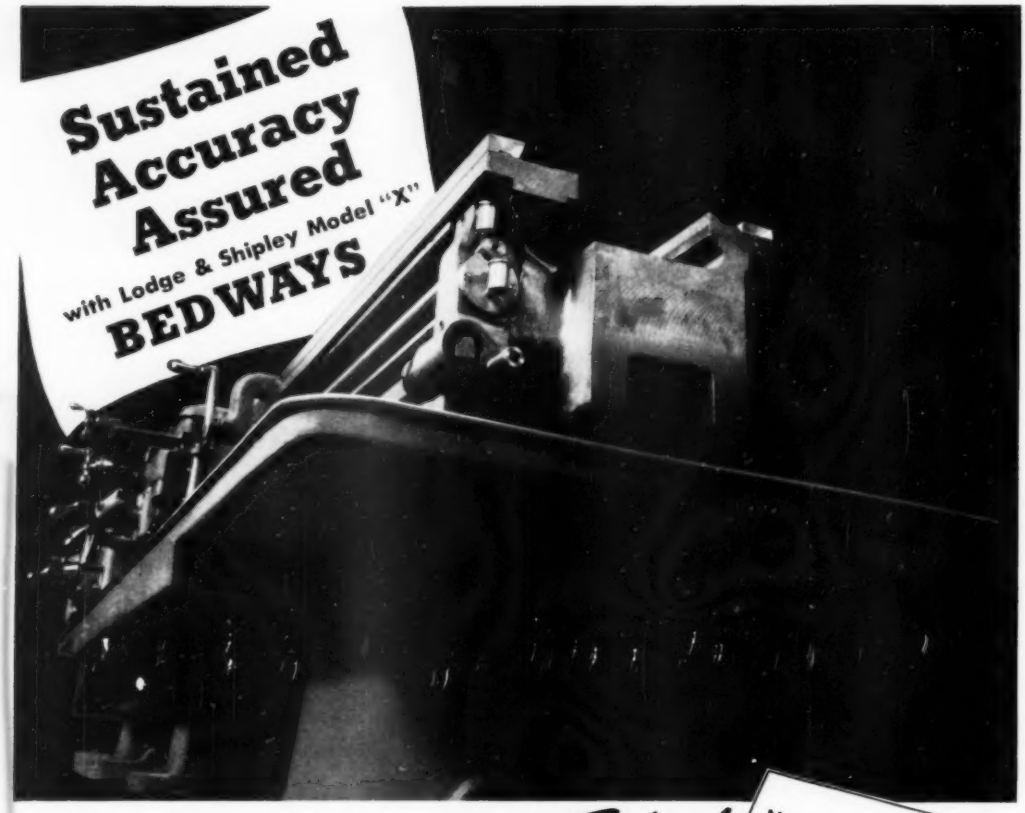
The dispensing of machine information is the responsibility of the manufacturer. Realizing this, CONE has prepared an analysis chart that should prove very useful to those seeking more specific information about multiple spindle automatic bar machines. Your copy is free. There is no obligation.



A comparison with ALL Automatics will lead you to

Conomatic}

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.



Another Lodge & Shipley *Profit Feature!*

● Practically eliminating the problem of bedway wear, Lodge & Shipley Model "X" Lathes are equipped with hardened and ground tool steel bedways (59-64 Rockwell C). Finish ground with great accuracy, *separately from the lathe*, these bedways are completely interchangeable. Their alignment with the lathe is assured and maintained by the tongue-and-groove construction.

The shape of the bedways is all important too, particularly the front or angular guideway, developed entirely by Lodge & Shipley and proved in more than 13 years of use. All guiding of the tool carriage is done by a combination of bearings on front, top and angular surfaces of the bedway.

With this construction, the carriage is guided at a point directly above the driving point. Whether drive is through the rack or the lead screw, there is no tendency for the carriage to "twist" or climb on the bedways, as is the case with conventional inverted Vee bedways. Any trend toward such twist or climb is rigidly resisted by the dovetail design of the carriage bearing against the angular surface of the bedway. Full length adjustable gibs provide adjustment for a positive, never-varying bearing on the bedway.

No Appreciable Wear in 50,000 hours of continuous use!

Think of it: No significant decrease in famous Lodge & Shipley accuracy . . . over the equivalent of more than 25 years of normal 8 hour per day use!

Easily Replaced if ways are damaged

You can't wear out Lodge & Shipley hardened ways, but if they're accidentally damaged, you can replace them, avoiding a several thousand dollar bill for lathe rebuilding!

THE **Lodge & Shipley** COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Your LODGE & SHIPLEY *Engineer* will gladly give you a more detailed explanation *and* demonstration. Call him or write for detailed literature which shows outstanding Profit Features.

REDESIGN TRIMS LENGTH 5¼ INCHES, CUTS UNIT COST $5.70

Series D Wayne water pump uses machined shoulders to position bearings on shaft. 2 Truarc rings hold bearings in housing. Locknut holds screw-type stuffing box that requires periodic tightening.

New design uses 4 Truarc Inverted rings (2 external, 2 internal) to position shaft, retain bearings. Inverted rings provide shoulders of uniform section height. 1 Standard ring secures maintenance-free mechanical seal.

Redesign with Truarc Rings helps save $5.70 per unit for Wayne Home Equipment Company, Inc., Fort Wayne, Ind. It gives them a more compact product, eliminates a separate bearing pedestal and a skilled-labor grinding operation. It facilitates use of maintenance-free mechanical seal instead of old type stuffing box.

Redesign with Truarc Rings and you too will cut costs. Wherever you use machined shoulders, nuts, bolts, snap rings, cotter pins, there's a Truarc Ring that does a better job of holding parts together.

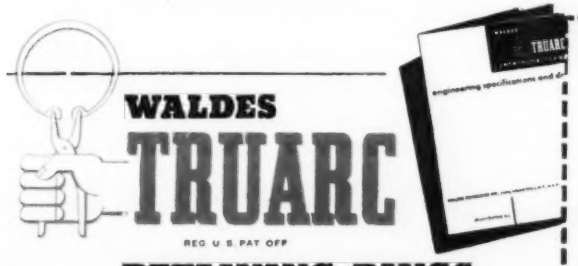
Truarc Rings are precision engineered. Quick and easy to assemble, disassemble. Always circular to give a never-failing grip. They can be used over and over again.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

REDESIGN WITH 5 TRUARC RINGS GIVES THESE BIG SAVINGS

- *Cuts length 5¼ inches*
- *Cuts total labor 15.3%*
- *Eliminates skilled-labor grinding operation*
- *Saves 38.3% materials*
- *Allows use of stock-size shaft, smaller bearings*
- *Eliminates separate bearing pedestal*

TOTAL UNIT SAVING . . . $5.70



WALDES TRUARC

REG U. S. PAT OFF

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,302,948; 2,405,404; 2,418,812 AND OTHER PATS. PEND.

Waldes Kohinoor, Inc., 47-16 Austel Place AM-101
Long Island City 1, N. Y.

Please send 28-page Data Book on Waldes Truarc Retaining Rings.

Name_____

Title_____

Company_____

Business Address_____

City_____ Zone____ State_____ ★

Van Keuren WIRE TYPE PLUG GAGES

VAN KEUREN FULL 2" GAGE

AGD 1¼" GAGE

WHICH GAGE WILL YOU BUY?

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies are now free upon request.

Wire Type Plug Gages were originated by The Van Keuren Co. over 25 years ago. In 1948 this design was adopted in shorter lengths as the AGD standard for gaging holes from .030" to .510" diameter. The Van Keuren Co., because of years of pioneering, is able to offer the extra length at little or no extra cost.

You cannot afford to lose this extra length. When you need plug gages obtain a quotation from The Van Keuren Co.—Compare COST PER HOLE GAGED. You can be assured of quality and accuracy. A double inspection at the factory eliminates your inspection expense. No time will be lost waiting for replacements. You can count on prompt delivery from a stock of 2 million wires. Specify Van Keuren wire type gages and get the most GAGE for your GAGE DOLLAR.

Send for Supplement 19 showing quick and easy method of getting 4 to 10 gages from 1 VK wire type gage unit.

Available in

TOOL STEEL **HIGH SPEED**
CHROMIUM PLATE **VK CARBOLOY**
FOR SUPERSERVICE **Phone Watertown 4-4394**

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

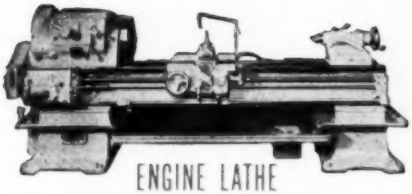
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

SPRINGFIELD

LATHES

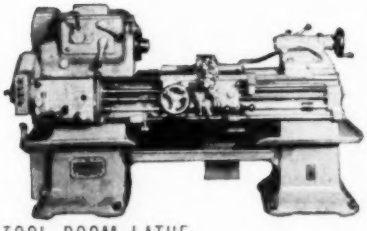
Solve every lathe turning problem

Adaptability to every lathe turning problem and extreme versatility are characteristic of Springfield Lathes. Built with close precision and strict adherence to the highest standards for each component part, they are rugged, reliable, accurate performers on all types of work.



ENGINE LATHE

Anyone of the 16 speeds can be selected quickly and easily to meet the requirements of the tool and the work. Low speeds for heavy cuts or high speeds for carbide cutting tools are instantly available. The Springfield 3-lever speed shifting system reduces the amount of shifting required in the normal sequence of operations.



TOOL ROOM LATHE

Sixty quick change threads and feeds give an exceptionally broad setting for many kinds of work. Threads such as 11½ and 27 pitch which usually require transposition gears are included in these ranges and the standard feeds and threads can be varied greatly.

Easy to set up and operate, these modern lathes are noted for their wide application and their accurate, sustained performance on all lathe turning work. Ask about their adaptability to your own turning problem. Springfield Lathes can solve them—and on a high production schedule.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

ARMSTRONG

Quality TOOLS

NOT A COST, BUT AN INVESTMENT

That Pays Year After Year...

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

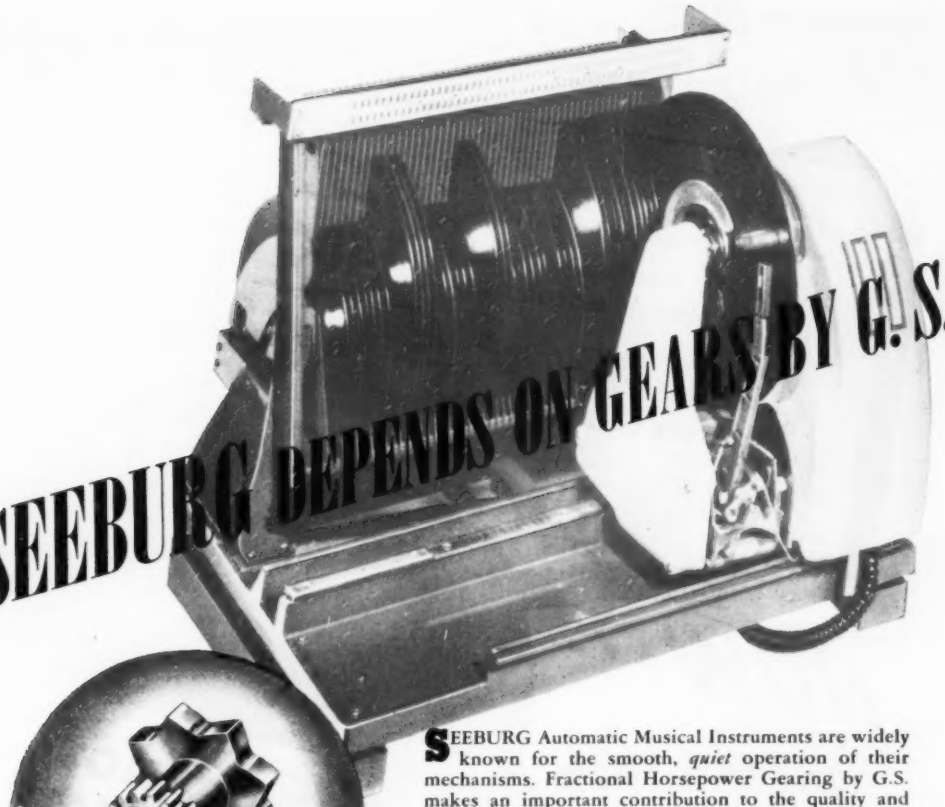
ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

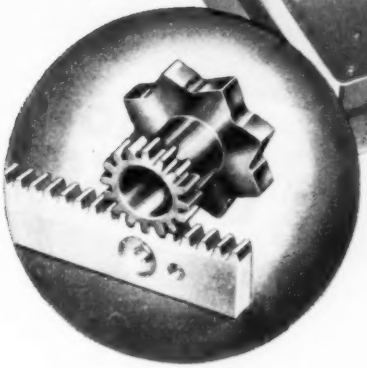
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

SEEBURG DEPENDS ON GEARS BY G.S.





SEEBURG Automatic Musical Instruments are widely known for the smooth, *quiet* operation of their mechanisms. Fractional Horsepower Gearing by G.S. makes an important contribution to the quality and *dependability* of these fine machines. SEEBURG has for many years depended upon G.S. for the high grade small Gears they need. Join the fast-growing list of satisfied users who have found improved performance and moderate cost through entrusting "G.S." with *all* of their Fractional Horsepower Gearing needs. Without cost or obligation, write today for suggestions, expert engineering aid, and cost estimates. Send along blue-prints, samples and quantities required.

SEND FOR *our 4 page catalog bulletin illustrating and describing many different types and applications of G.S. Small Gearing. It may offer valuable suggestions and ideas you can use. Write today.*

FRACTIONAL HORSEPOWER GEARS

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GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

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WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

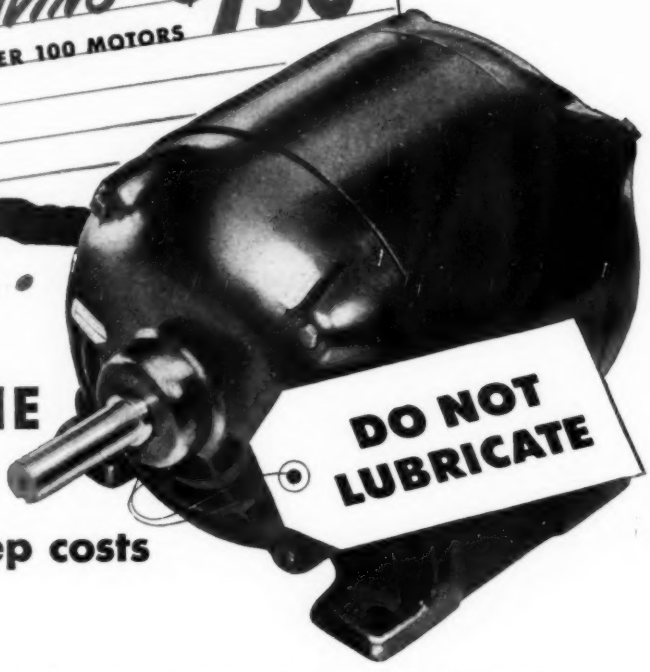
YOU CAN BE **SURE**.. IF IT'S

Westinghouse

SAVING BY ELIMINATING LUBRICATION $270

SAVING INDICATED BY REDUCTION OF MOTOR OUTAGES $480

TOTAL SAVING PER YEAR PER 100 MOTORS $750



NOW...

LIFE-LINE slashes a-c motor upkeep costs

Here's how Life-Line motors can save you half the upkeep cost, and more.

A recent survey of 114 large motor users—operating 131,626 a-c motors of 1 to 50 hp—shows how much motors *really* cost when you figure actual "Life Cost".

The survey shows that the yearly average cost of periodically lubricated motors was $270 for every hundred motors installed.

On lubrication cost alone, Life-Line motors saved this $270. That's because Life-Line requires no periodic lubrication—no added lubrication of any kind.

The survey also indicates that the yearly outage cost per hundred motors, for repairs and lost machine and man-hours, was $960.

The record of 500,000 Life-Line motors in service, to date, indicates a failure rate averaging less than half that of conventional motors covered by this survey. This means over 50% indicated reduction in motor outage costs—in short, a possible saving of $480 per year with Life-Line.

Add these savings—$270 for lubrication plus $480 for outages—and the result is $750 per hundred motors per year.

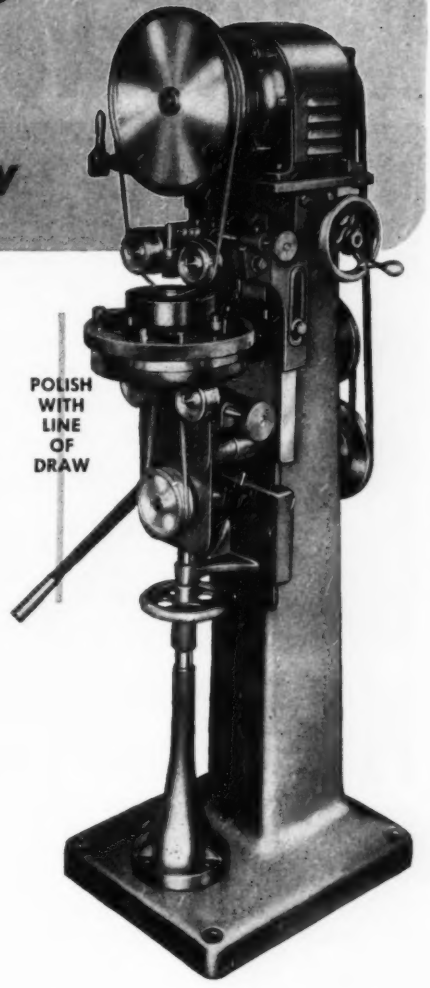
Can you afford to pass up savings like these? Get the facts on the savings possible in your plant. Ask your nearby Westinghouse representative for a copy of B-4321 "How to Cut Motor Costs $750". Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21514

Westinghouse *Life-Line* Motors

HARTFORD *Special*

DIE POLISHING MACHINE

pays for itself . . . quickly



saves time

Length of time required to polish dies with this machine can be computed in seconds or minutes. Endless abrasive belt is driven at 5,000 lineal feet per minute. Compare the speed of this motorized machine with time-consuming hand lapping or other polishing methods!

increases die life

The inner surface of the die need not be materially reduced. Dies can be held to size and repolished more often without reworking. Operation of the machine is so easy that dies can be polished quickly before any grooving or pitting appears. Accommodates almost any style of die, such as dies used in drawing rods, bars and tubing, as well as deep drawing dies.

finer finish

This abrasive belt method polishes dies parallel with the line of draw of work through the die. A finer mirror-like finish is imparted to the die which results in a better and finer finish to the work. Machine is adjustable to prevent bell mouthing of the discharge side of the die if necessary.

cuts cost

Since the Hartford Special Die Polishing Machine cuts polishing time to a fraction of former methods, increases the number of times dies can be repolished without reworking and increases the overall efficiency of the dies, its economy is apparent. Write now for full details on this modern method of die polishing.

HARTFORD *Special*

. . . the standard for special machinery

THE HARTFORD SPECIAL MACHINERY CO.

287 Homestead Ave., Hartford 5, Conn.

Please send me free Bulletin PM 100 describing your Die Polishing Machine.

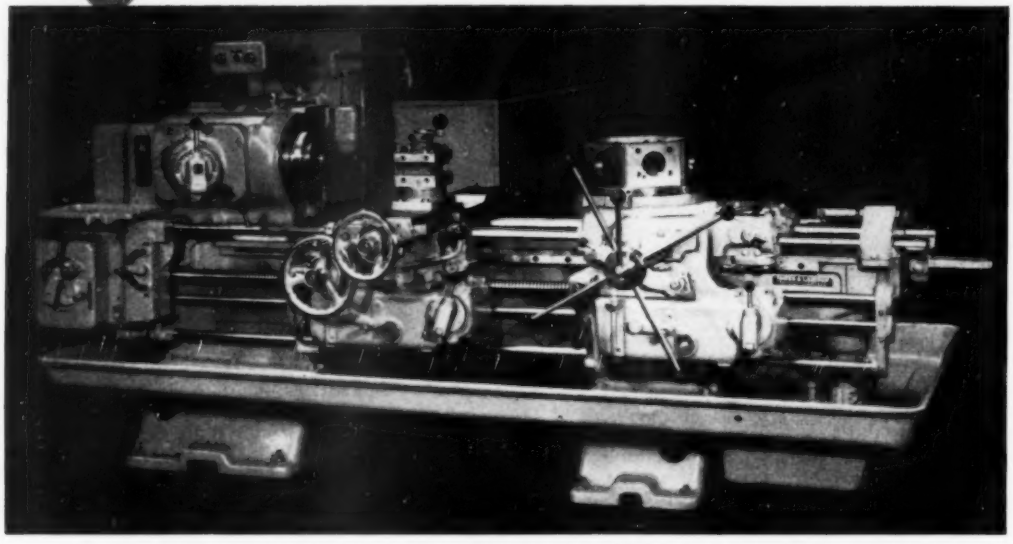
Name _____ Pos. _____

Company _____

Address _____

City _____ Zone _____ State _____

Over 4½ Tons of High Powered Precision!



NEW JONES & LAMSON SADDLE TYPE 7A UNIVERSAL TURRET LATHE

2½" Bar or 12" Chuck

Rugged, Functional Design, Heavy, Deep, Rigid Bed Gives New Production Efficiency

Full Length Lead Screw:

Carriage and Saddle Threading to Full Turning Length

Wide-Range, Single Lever Thread Selector

All-Sliding Gear Quick-Change Gear Box

Automatic Safety Interlocks on Threading Controls

Power Rapid Traverse for Cross Slide and Saddle—Power Indexing Turret

Lower, Wider Chip Pan with Centrifugal Coolant Pump

12 Spindle Speeds with 20 Horsepower Constant Speed Motor

All Tooling Interchangeable with Previous 7A Models

— ***PLUS*** all the famous Jones & Lamson characteristics of easy operation, versatility and repetitive accuracy!

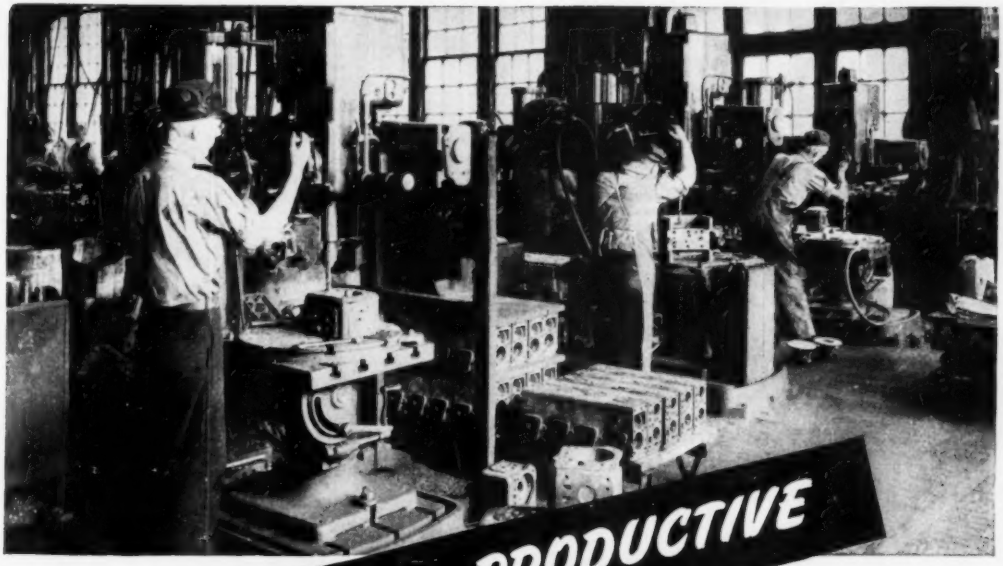
Built & Powered to Produce *MORE chips per tool, MORE pieces per hour, MORE profit per job* — than any turret lathe of comparable size!

Turret Lathe Division **JONES & LAMSON** MACHINE COMPANY

Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

Write to Dept. 710 for Complete Information

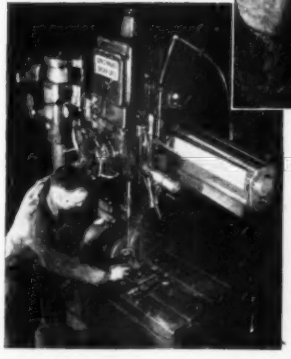


HIGHLY PRODUCTIVE

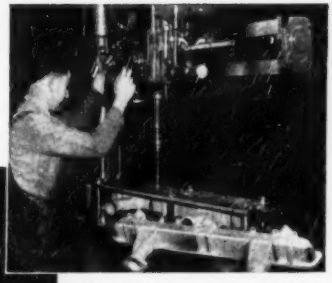
High speed brought profit on these jobs. These quiet, smooth, Cincinnati Bickford High-Speed Super Service Drills are equipped with modern, easy controls—all centralized on the head, at the operator's hand. They give long, trouble-free performance.

Every operation conveniently controlled—nine spindle speeds controlled by one lever—dials large and easily read—arm swings with a finger-tip ease—automatic lubrication, and many other features to give the greatest ease of performance.

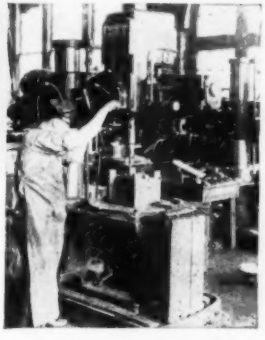
Write for Bulletins R-26A and R-21B.



This Super Service Radial reduced the time on this job from thirteen minutes to five minutes.



Due to the construction of this machine, long drills are used with accuracy.



On this job a universal table increases speed of production.

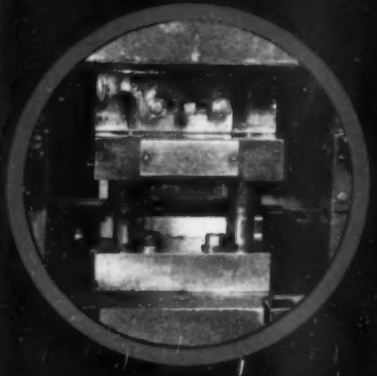
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit
Makes the Balanced Machine

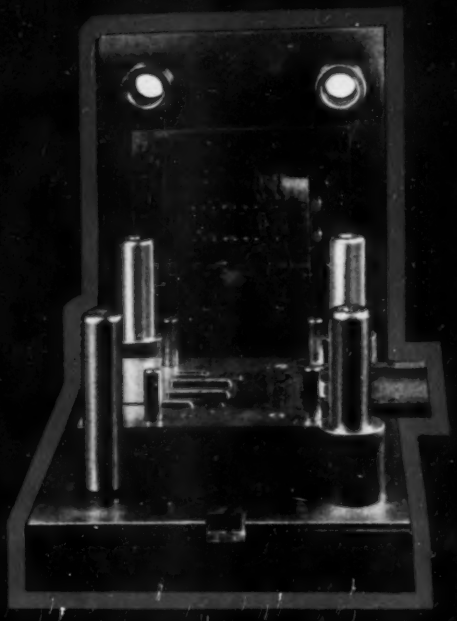
THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

Long range stamping program protected with

DANLY
PRECISION DIE SETS



Close-up view of the die installation in the press. Continuously fed strip stock can be seen passing through the die, emerging at the left in processed form.



A Danly Precision Die Set protects the functioning accuracy of this complex die . . . at 160 strokes a minute

WESTERN ELECTRIC SCHEDULES 75,000,000 PARTS FROM THESE TOOLS . . . AT 300,000 PARTS PER GRIND!

Send for this Free Booklet

to see how Danly's special die set machining service can cut your costs still further.

Write to . . .

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue, Chicago 50, Illinois

These dies made at the Hawthorne Works of the Western Electric Company are an example of a tough, complicated job of die making that pays off in terms of quantity production. Eight progressive stages change the coil stock into the finished stamping—"contacts" for step by step dial telephone equipment. One set of dies and one press do work which would otherwise take several setups.

To maintain the required close clearances between punch and die, this important set of dies is protected by a Danly Die Set. This prevents premature tool wear and objectionable burring—an important consideration where parts receive no final finishing.

Safeguard Future Production

Only when the diemaker's precision is completely safeguarded by the die set can future production be predicted. Long range scheduling is necessary in the Electrical Industry where the output of contacts, switches, laminations and like parts number into millions. Quantity lots are standard—long range production from a set of dies must be counted on.

Danly Precision Die Sets are one important reason why customers can get the maximum number of parts per grind and can accurately predict total production. That's why it pays off to specify "Danly Precision" on Standard or Special Sets.

DANLY

Over 25 years of dependable service to the stamping industry

SPOT NEWS OF METALWORKING

A spectacular tooling program for a new engine for a division of one of the automotive Big Three at Detroit is likely to break during the next few months. The management was on the verge of placing orders for this program months ago, but action was delayed indefinitely because of certain design changes.

Buick has put on the shelf for possibly a year its plans for introducing a V-type engine of the so-called Kettering design. Tooling for such a job, including new plant, is reported to have been estimated by the Buick management to cost $26 million.

New jet engine tooling job involving expenditure of $25 million for machine tools, dies, jigs and fixtures is being considered by Air Forces. If the "go-ahead" signal is given, outlay will be made by companies which will be awarded parts contracts.

Signs of times: Lackawanna Railroad soon will build diesel engine maintenance shop at Scranton, Pa. Its steam engine shops are for sale.

A process to emboss with chrome any design wanted on a steel roll has been developed by a midwestern engineer. Tests now are being run on both hard and soft steel rolls to determine the useful life of the rolls and of the patterns.

Air Force is preserving its surplus machine tools by cleaning them and then maintaining them in dry storage with little preservative on them. While in storage, machines will be kept in good condition by civilian companies, which will obtain maintenance contracts by competitive bidding.

An improved photo-grid technique for determining elongation of sheet metal has been developed by scientists of the National Bureau of Standards. The new technique overcomes difficulties involved in previously used methods and provides a more reliable procedure for establishing the behavior of sheet metal during forming.

Some $7,332,000 in American machinery and equipment will be purchased here by buying missions from four of Italy's key industries. Equipment sought: a billet rolling mill, an oxygen-producing plant, a welded pipe producing plant, a rolling mill for plating, and oil refining equipment. The latter includes a unit for processing 3000 barrels a day of high-octane benzine.

A small motorbicycle engine with a gasoline consumption of no more than one liter per 100 kilometers has been invented by a Dutch engineer whose name is being kept secret. The invention is claimed to be revolutionary. Manufacture of the bikes will begin in Amsterdam. A first series of 25,000 is already prepared.

Synthetic mica, developed by the Office of Naval Research, can be made in bulk form and readily machined with ordinary machine tools to form any electrical insulator parts. It is now being considered for commercial production.

Automatic and semiautomatic welding heads are in use at the Naval Engineering Experiment Station, Annapolis. The control valve of the automatic welding head is actuated by an electronic device. The semiautomatic weld head is a hydraulic apparatus without gears or other mechanical devices which works as a hydraulic jack released under load.

Devaluation had its effect on one State of Washington machinery manufacturer whose plant was counting on two substantial orders for heavy equipment in British Columbia. After devaluation, the Canadian government declared the machinery must be made by the company's B.C. affiliate, which never had made machinery of that size or complexity before. Loss of this business may force the Washington plant to cut back employment, now running about half of the high level of the last three years.

Gaging Metalworking

Immediate effects of the steel strike on metalworking operations will be negligible. An AMERICAN MACHINIST telegraphic survey of prominent steel users shows that work can be continued for three to four weeks with only a slight dip in activities. That is true in such important metalworking fields as automobiles, tractors and farm implements, electrical goods and industrial machinery.

► There has been relatively little heavy stocking of steel in anticipation of the strike. Most consumers have been driving for reduced inventories. Steel was included in that drive. Greatest danger comes from running out of small specialty items which go into assembly of a product, thus shutting down assemblies and manufacture of other parts so that stocks on hand do not get out of balance too much.

If the strike should hold as long as four weeks, operations in metalworking will decline gradually, with a plant closing here and another there. When the stock of the item in shortest supply is used up, plants will go down until that stock is replenished.

► The strike will have a damaging influence upon the demand for other metals. With steel shipments stopped, there is no point in taking in unnecessary amounts of copper, lead, zinc and other materials.

Unless the strike should be prolonged—beyond 30 days—it will not disrupt metalworking very much. Backlogs of consumer goods orders will pile up and will furnish work on a sizable scale well into next year.

30-Day Inventory in Gray Iron

The gray iron foundry industry can continue to operate for the next 30 days on its present inventory, according to the Gray Iron Founders Society, with some companies having sufficient supplies of coke, scrap and pig iron to last for an additional 30 days. However, the industry expects to be stymied on production within the next three weeks by customers' hold orders, because of their lack of steel.

The steel strike came at a particularly bad time for the gray iron casters since the industry was just getting off the floor from the slump of last summer which saw production go down to 40% of capacity. It climbed back up to about 60% when the strike occurred.

During the low period—July and August—the majority of the foundries operated at a loss, due to short production. A 60% operation at least permits them to break even; in the highly mechanized foundries, that rate of operation makes for a small profit.

Fractional Motors Doing Better

There has been a resurgence of demand in some metalworking lines.

REFRIGERATOR SALES SPURT, BOOSTING TOTAL APPLIANCE BUSINESS

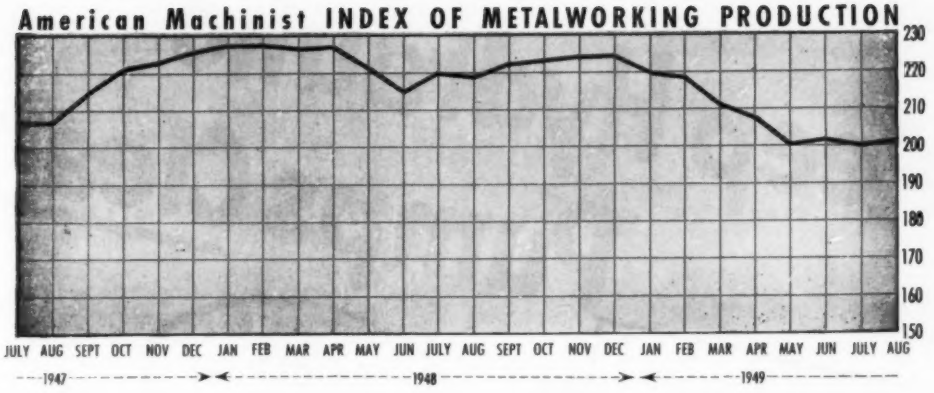
UNADJUSTED
ADJUSTED FOR SEASONAL FLUCTUATIONS
NO SEASONAL ADJUSTMENTS FOR 1946 – 1948 INCLUSIVE
350
300
250
200
150
100
50
0
1947
1948
1949
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Index From National Electrical Manufacturers Association shows status up to July

◄ **Electric Household Refrigerators**

◄ **Other Major Electric Appliances**

Data from NEMA News, Oct. 4, 1949
(Aug. Month 1936 = 100)



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Aug. 1949 (preliminary)	201	192	192	244	288	135
July 1949	200	198	191	234	279	135
Aug. 1948	219	247	225	224	306	146

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

particularly those linked to consumer items. Household appliance people, especially refrigerator makers, are feeling good about the outlook. The upturn in their sales is not regarded as a mere flash. They expect business to be brisk up through the first half of 1950.

► This upswing in consumer products has brought a marked gain in demand for fractional horsepower motors. Plants which were on short hours are now running six days a week (a costly operation because of the overtime pay involved). They probably will not be able to get back onto a 40-hr schedule until after the end of the year.

Electric Apparatus Active

Manufacturers of heavy electrical apparatus have plenty of work on hand to stay at full capacity for a long time. Big turbines, for example, are being quoted for 19-months' delivery. It appears certain that turbine plants will continue full tilt during 1950 and 1951, though new business booked in recent months has been slim.

► Demand is very good in transformers, switchgears and allied electrical products. Electric control units have been doing well, too.

► Builders of diesel-electric locomotives report their shops busy, but sales have been off. Tractor and farm implement manufacturers have a comfortable amount of business on their books.

Machine Tool Exports To Be High

Despite some cancellations of orders received by the machine tool industry from foreign buyers as a result of devaluation, ECA officials are confident that the total dollar volume of machine tools and other metalworking machinery exported to Europe in the fiscal year 1950 will be the same as originally figured. For machine tools alone, the amount is put at $75 million.

► Most contract cancellations were not based on firm contracts. They were contingent upon allotment of dollar exchange by the European country involved to the would-be importer.

► Backlog of demand for U.S. machine tools in Europe is still, after devaluation, many times in excess of the dollars available now or in the next two or three years.

► To put it simply, dollars (foreign exchange) and not the price of machine tools in Europe will be the limiting factor on export business. ECA has a long list of machine tools in high demand in Europe which cannot be obtained anywhere else but in the United States. They just aren't made elsewhere.

Tool & Die Orders Rise

An increase of 10% in orders in August over July has been reported by members of the National Tool & Die Manufacturers Association with a resultant increase in that industry's backlog. This marks the fourth consecutive month the backlog has shown an increase. Orders placed with the industry during August were the highest since March of this year.

Shipments in August were 82% of those made for the corresponding month of 1948 and for the eight months of this year shipments total 86% of those for the same period in 1948. Shipments in August were 15% ahead of those for the previous month.

Backlog for the industry was up 3% due to a combination of less hours worked and the increase in new orders.

► Brightest spot is the number of "live" queries upon which bids are wanted. Such queries are not confined to any one industry but are coming from a number of companies representing a wide range of industry.

Screw Machine Shipments Increase

Matching the general industrial trend, shipments of screw machine products climbed sharply in August. New orders moved up encouragingly, and a modest increase is reported also in dollar value of inquiries per machine.

Gearing Volume Climbs

Volume for the gearing industry increases by 35.7% in August over the previous month, the American Gear Manufacturers Association reports. With the AGMA Index based on 1935-9 100, the August index figure stands at 262.0.

Keep Hydraulic Pumps Clean

LIKE THIS

Note cleanliness of this part taken from a hydraulic pump. System charged with Texaco Regal Oil (R & O).

Ordinary oil was used in the hydraulic system from which this pump part was removed. Damage from rust and sludge resulted.

Photos Courtesy of American Engineering Co.

USE Texaco Regal Oils (R&O)

Make pumps and other parts of hydraulic systems last longer and work more smoothly by charging the systems with *Texaco Regal Oils (R & O)*. These world-famous, turbine-grade oils keep your hydraulic mechanisms operating at top speed and efficiency.

Texaco Regal Oils (R & O) are fully resistant to rust and oxidation, and are specially processed to prevent foaming. They keep hydraulic systems clean . . . protect pumps and valves against wear and fouling . . . assure smooth, responsive hydraulic action for longer periods of time.

There are suitable viscosities of *Texaco Regal Oils (R & O)* for every size and type of hydraulic mechanism. No "cutting back" is required. These quality oils are recommended by leading builders of hydraulic equipment, and many ship their units charged with them.

Let a Texaco Lubrication Engineer help you improve the efficiency of all your plant machinery. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Why Not Get Your Share?

In surveying the outlook in many segments of metalworking, we find a gratifying amount of optimism.

Even the coal and steel strikes have not shaken the belief of most manufacturers that the fourth and first quarters will be good.

No one feels panicky. No one thinks the country is headed for disaster. Business has turned upward for many companies. And it isn't all merely a seasonal upsurge.

Economic conditions are essentially sound. National income is high and should stay there.

Household appliance people underestimated their market. After a period of curtailed production, they have expanded and are pretty happy about what's ahead.

Automobile makers see another good year in 1950. They are more cheerful now than six months ago.

No reliable estimates are yet at hand as to capital expenditures for plant and equipment next year. But we do know this much—they have been high all during 1949. And expert observers are guessing only a mild dip in 1950.

Much other evidence is available about business, more of it on the plus side than on the minus side. There are bad spots, to be sure. But on the whole, things are looking bright ahead.

The point is this: Despite strikes, despite devaluation, despite the cold war, despite lack of helpful Congressional legislation, the short-term outlook in metalworking is reasonably promising.

Operations, based on manhours worked, are twice as high as in 1939. They are likely to stay at that level.

That means a lot of business is being done and will continue to be done. It is going to be done by the manufacturers who go after it aggressively and intelligently. It will not come in over the transom.

The management which wrings its hands over industry's experiencing one crisis after another and which waits for a return to normal times probably will be forced out of business altogether.

For the truth is that normal times, as we traditionally have thought of them, are gone forever.

The best thing that metalworking management can do, under the circumstances, is to adapt itself to the changed times.

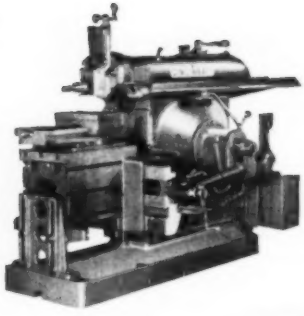
It should go out and do business under today's conditions on the basis that those conditions will be with us permanently.

There will be plenty of business during the next six months. Why not make a stiff fight for your share?

Burnham Finney

EDITOR

Shaping a BIG job...



Internal shaping bearing seats in this 5500-lb. steel plate to a tolerance of .001 indicates the accuracy and rigidity of Cincinnati Shapers.

The rapid and accurate metal removal, and the low-cost setup for shaping this 12′ steel plate on the sturdy Cincinnati table, give low-cost operation.

The unusual flexibility of change from job to job in minimum time and with minimum costs of tooling and fixtures also has made the Cincinnati Shaper the handy man of industry.

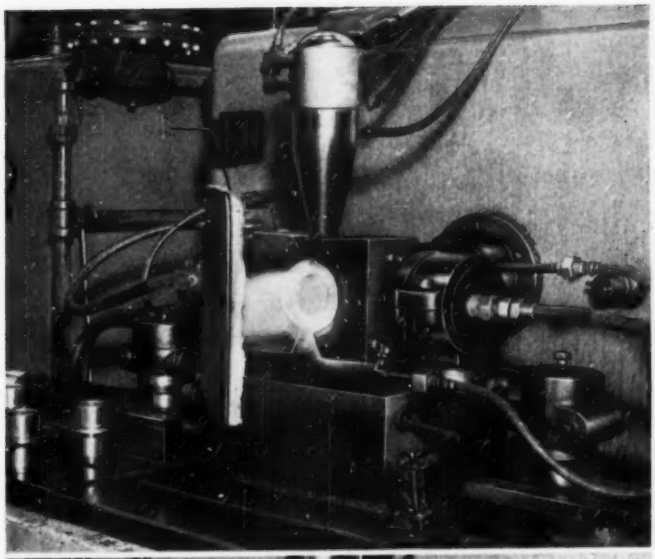
A versatile Cincinnati Shaper will be a busy and profitable machine in your shop.

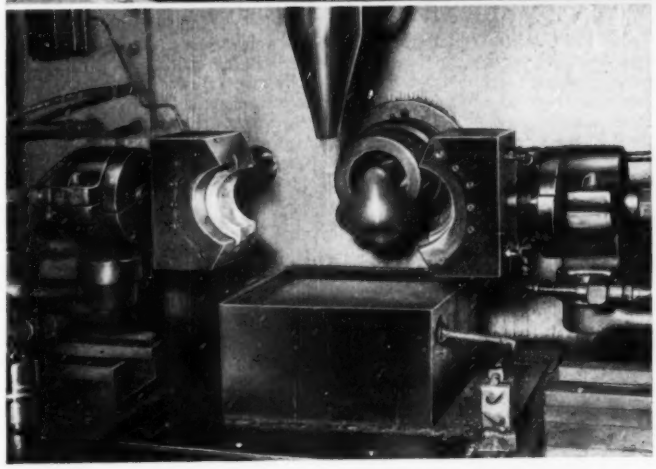
Write for Catalog N-5 for detailed description of the types and sizes of Cincinnati Shapers.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

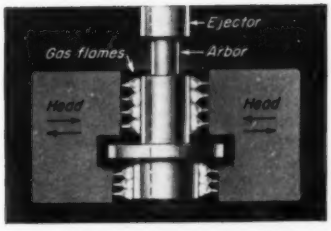




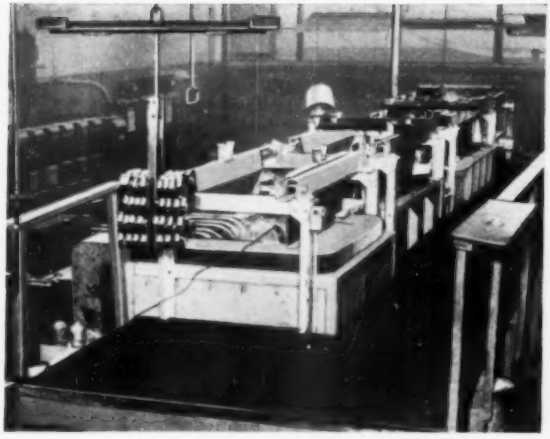
HUB SURFACES of a Dynaflow part are flame hardened in 22 sec on a Cincinnati flame-hardening machine, while the collar is not affected and can be drilled in a subsequent operation. The operator loads the part onto an arbor and trips a start button. Two air-operated heads then close, a precisely controlled propane - oxygen mixture is turned on and ignited automatically. Jets in the curved head faces direct the flames radially inward upon the hub surfaces only. When the hub surfaces are up to heat, as determined by a Leeds & Northrup "Rayotube," the gas is automatically shut off and the heated piece is ejected into a quench tank. Some heating of the collar is unavoidable, but its temperature does not reach the hardening range. Precise automatic control yields the required uniformity of product, and permits attainment of a high production rate.

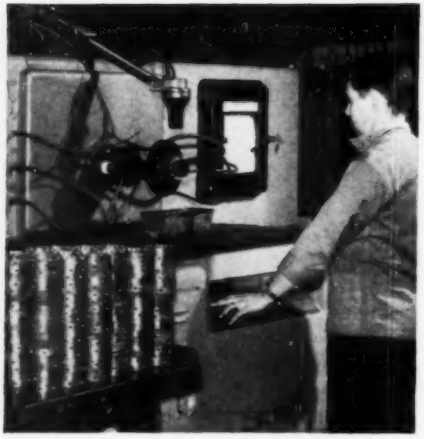
Buick Uses Localized Heat To Harden Small Parts

BY H. A. MALONEY, Plant Metallurgist
BUICK MOTOR DIVISION, GENERAL MOTORS CORPORATION



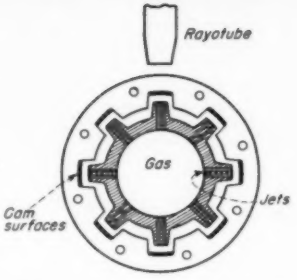
Flames do not impinge on collar

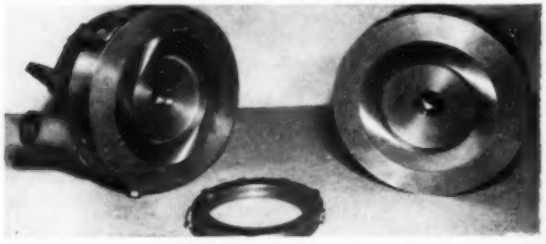




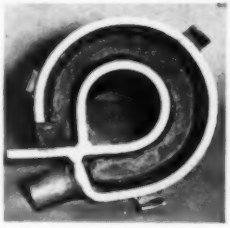
CAM RINGS receive two heat-treatments: (1) hardening, isothermal quenching and drawing in three successive Ajax electric salt baths to develop adequate strength in the SAE 4063 machined forgings, and (2) localized hardening of internal cam surfaces by flame hardening. Formerly, induction heating was used for the second operation, but only two of the cam surfaces could be heated at once by rather small fragile coils and repeated heatings forced the use of a water quench since oil caught on fire.

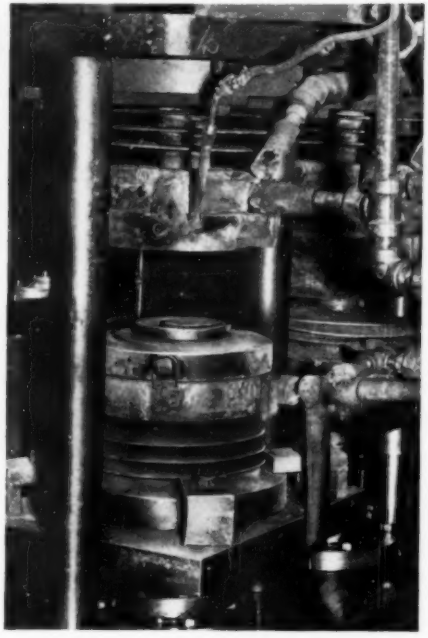
In flame hardening, the ring is loaded on an arbor with a section having jetted protuberances that reach into the internal "splines" in the part. Gas flames impinge on the flat inclines, or cam surfaces, in which rollers of a roller clutch operate. When the OD of the ring reaches a temperature related to the proper hardening temperature for the cam surfaces, a Leeds & Northrup "Rayotube" control causes the part to be ejected into an oil quench.

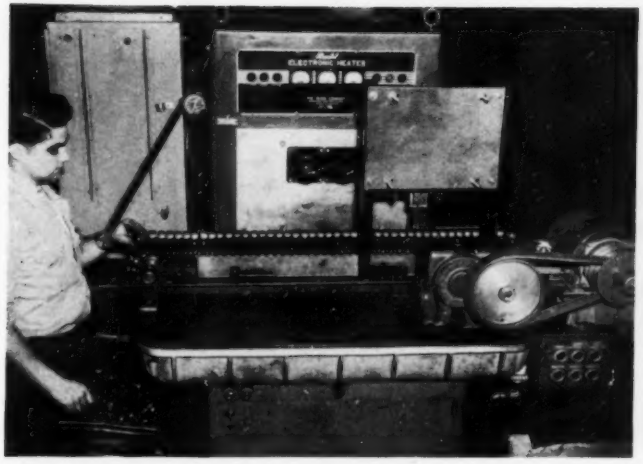


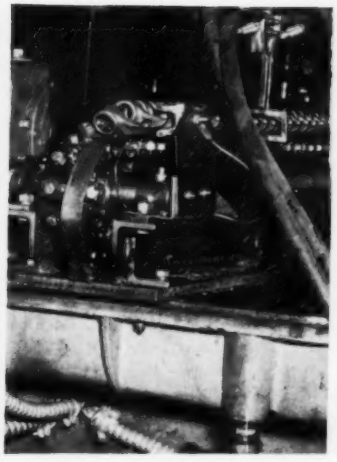


STEEL CLUTCH DISKS are "set" in dished form by heating the SAE 1045 parts at 850-900 F, while applying pressure to six at a time in a hydraulic press. Each half of the die is heated by a "stove" bolted to the outer face and warmed by city gas-air flames entering the tangential inlet. Heating for a 4½-min. cycle while under pressure causes the disks to retain a dish of 0.010-0.014 in., and the material also retains the original hardness of 24 Rockwell C as produced by cold reduction, according to the purchase specification. Several dies are set up in the press. Cooling flanges keep heat away from the press platens.

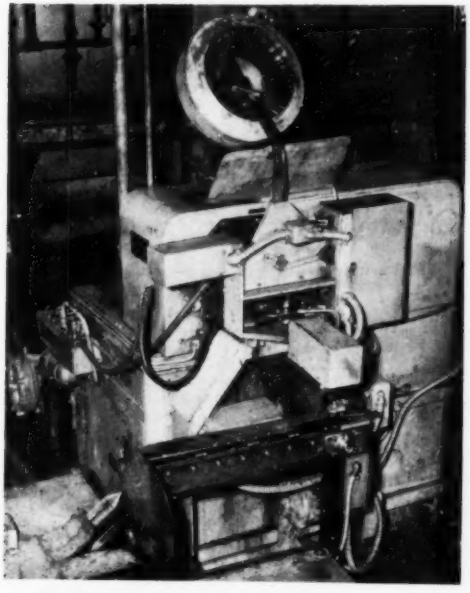


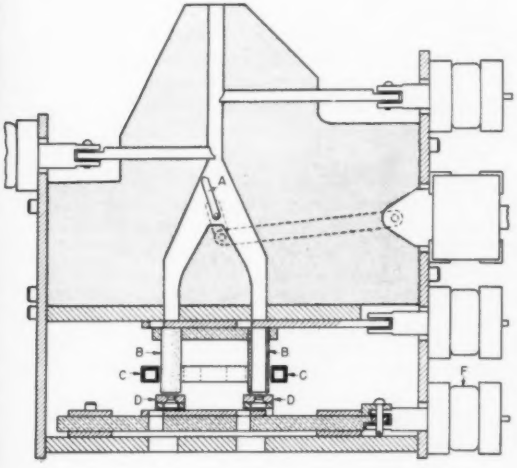






LOCALIZED HARDENING of valve rocker arms cast of malleable pearlitic iron is being done experimentally on a 20-kva Budd electronic machine. The castings are loaded by hand on a chain that positions the parts so that the end to be induction hardened will pass through a slot formed by two legs of a coil. Feed rate is 25 pcs per min. If a misplaced rocker arm touches the coil, burning out of the latter is avoided by special transformers that drop the coil voltage automatically. Heated work passing through the coil falls into an oil quench.





VALVE-ADJUSTING BALL STUDS are hopper-fed into a Tocco 30-kva machine for annealing a portion of the article. Faster operation is obtained by a fixture that heats the studs alternately in the two branches of a Y-channel. Studs are fed to the branch by a ratchet wheel in the magazine hopper. A solenoid-operated gate *A* (see drawing) flips the studs alternately into the two branches. Studs drop into two short insulating tubes *B* set inside the inductor coil *C*, which has a hollow-square section. In these tubes, the studs come to rest upon stops *D*. Stops are moved to right or left periodically by a solenoid *F*. When the gate moves, a heated stud drops through an opening and onto a steel belt where cooling occurs. One stud drops out while the one in the other branch is being heated. In this way, fast operation of the fixture is secured.

SIMPLE FIXTURES SPEED DISK GRINDING

Fixed positioning and fast clamping mean high production and consistent quality

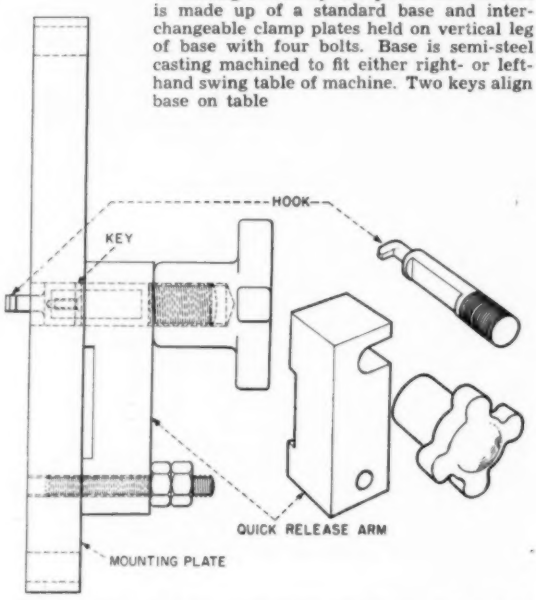
BY R. L. CLARK, Works Manager,
HANNA ENGINEERING WORKS

RIGHT-ANGLE FIXTURE for face grinding or milling relatively flat pieces on one side is made up of a standard base and interchangeable clamp plates held on vertical leg of base with four bolts. Base is semi-steel casting machined to fit either right- or left-hand swing table of machine. Two keys align base on table

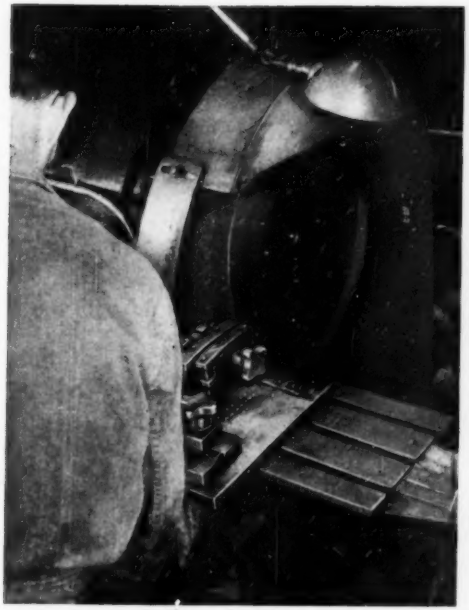
ACCURACY, rigidity, and ease of changeover feature a series of simple clamping fixtures developed for use on a Besley disk grinder at the Hanna Engineering Works. Most of these fixtures are for either right- or left-hand swing tables and some are interchangeable for face-milling operations.

Several jobs are done in fixtures that consist of interchangeable clamping plates arranged for mounting on the vertical face of a right-angle cast base. The base easily is lined up and bolted on the swing table, and all plates can be located and bolted to the face of any base. Quick-acting clamps hold the work during grinding or milling. Most of these clamps operate from the back of the plate to avoid interference with the wheel. This arrangement also makes the operator's job easier because he can hold the work in one hand while positioning and tightening the clamp with the other hand in a natural position.

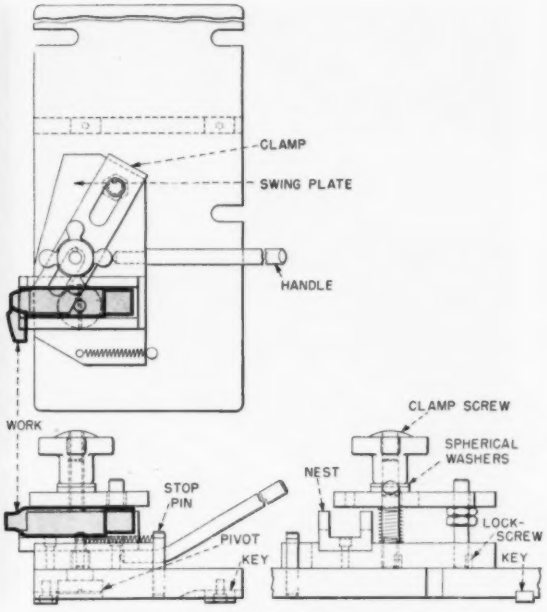
All fixtures and bases for the disk grinder are stored in a cabinet near the machine. Setups can be changed quickly and trips to the toolcrib are held to a minimum.



CLAMP PLATE for valve disks has hook clamp to lock cast disk on vertical face of plate. Three sizes of hooks are interchangeable in plate to clamp six sizes of castings. Quick-acting screw clamp has swinging spacer bar which fits under hand knob in back of plates. By loosening knob and swinging bar aside, operator easily can push clamp forward to release work quickly after grinding is complete



TWO-CLAMP FIXTURE for valve tiller bases permits the finishing of two different surfaces simultaneously. Between grinding passes, pieces are moved from first to second grinding position, thus finishing one part at each pass. Flat steel plate is bolted directly to swing table of disk grinder



RADIUS-GRINDING FIXTURE finishes curved face on valve stem. Fixture has interchangeable nest blocks to hold six different sizes of stem castings. Nest block and clamp assembly are mounted on swinging plate pinned to top of baseplate. Handle on swing plate permits operator to move plate to produce curved surface on head of stem. Spring at other end of swing plate returns plate to position as swing table is withdrawn from grinding position. Baseplate is bolted to swing table, and is held in accurate location with two keys

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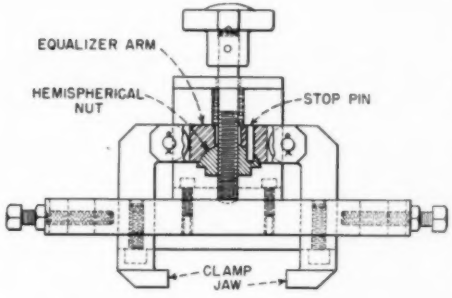
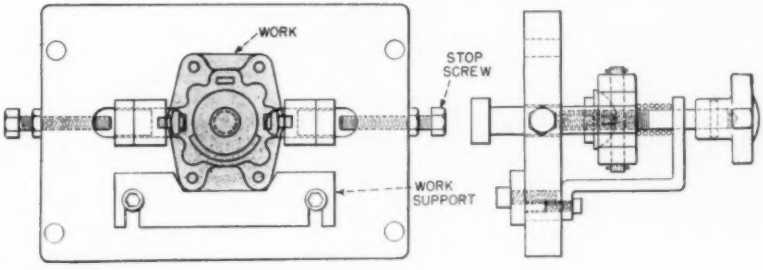
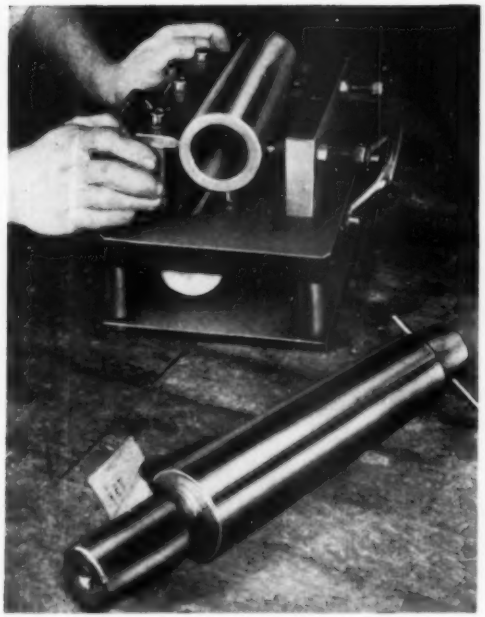
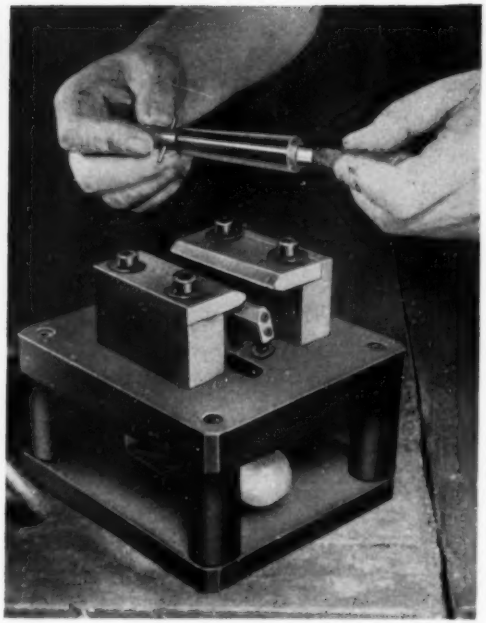


EQUALIZING FIXTURE holds valve bodies during surface grinding operation and also is designed for mounting on common base bolted to swing table of Besley grinder. On grinder side of plate, an adjustable support is bolted below work position, and two clamp jaws enter through slots in plate to hold work in grinding position. These jaws are connected with pins to equalizer arm moved by clamp screw. Hemispherical clamp nut on screw permits arm to adjust position to suit variations in casting thickness. Clamp nut does not rotate because of stop pin extending through equalizer arm into slot in nut. Support bracket holds clamp screw and equalizer-arm assembly in position in back of fixture faceplate







Taper gages are provided for every production, external-taper grinding operation in Scully-Jones plant. Work is held against a fixed knife-blade the edge of which is directly above a cylindrical frosted lamp in base of gage. Gage at left has two rows of adjustable Stellite-pointed screws, ground to 3/16-in. radius to support work in correct alignment with fixed blade. In foreground is master setting gage. One master is made for each production gage and carries same tool number for identification purposes. Enlarged cylinders or cross pins at small end of gage prevent use of masters for checking tapered bores, an operation that might damage their surfaces. Gage at right employs knife blades rather than screws to support work. One part is checked while the next is being ground

LIGHT GAGES CHECK EXTERNAL TAPERS

Easily constructed, these gages permit greater accuracy

and increased speed in checking precision tapers at production machines

BY BERNARD R. BETTER,
Director of Research
SCULLY-JONES AND COMPANY

ACCURATE inspection of tapers generally involves sine gages and precision indicators. But checking work at the machine is not considered a suitable application for this method. The operation usually requires considerable time and should be done at an inspection bench where shop vibration will not affect the readings.

For checking external tapers at the grinding machine, most shops employ ring taper gages and a bluing compound to show high points on the surface of the work. At Scully-Jones, production inspection of taper shanks on end mills and other cutting tools, on tapered reduction sleeves, on lathe centers, and on other similar tapered products was at one time done in this way. But when very accurate tapers must be produced in quantity, the method is not dependable. Thus, war-time production requirements, both for quantity and accuracy, led to a search for a

better method for checking tapers.

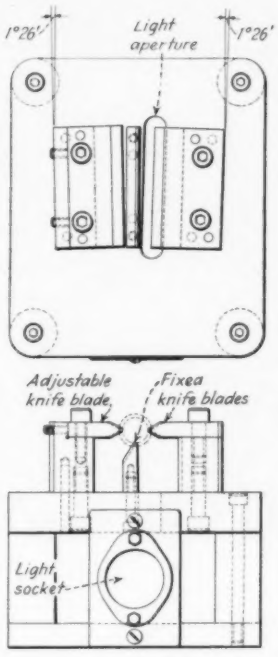
Study of the taper-gaging problem resulted in the development of a series of light taper gages, one for each size and type of external taper to be checked in the shop. Variation of only one ten-thousandth of an inch (0.0001 in.) between the knife-blade of the gage and the body of the external taper can be detected. The gages are also entirely suitable for use at production grinders in the shop and at the final inspection benches where more expensive tools previously were used.

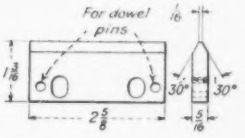
Two Types Developed

Two types of gage have been developed. Both operate on the same principle but differ in the design of support members that hold the work against a fixed horizontal knife-blade which serves as the gaging member. In the gage first developed, two rows of adjustable screws, locked in position with nuts, support the work against the knife-blade. In the second type, two knife-edges are substituted for the rows of adjustable screws. This model is an improvement over the first, because knife-blades are easier to locate in proper position than are screw points.

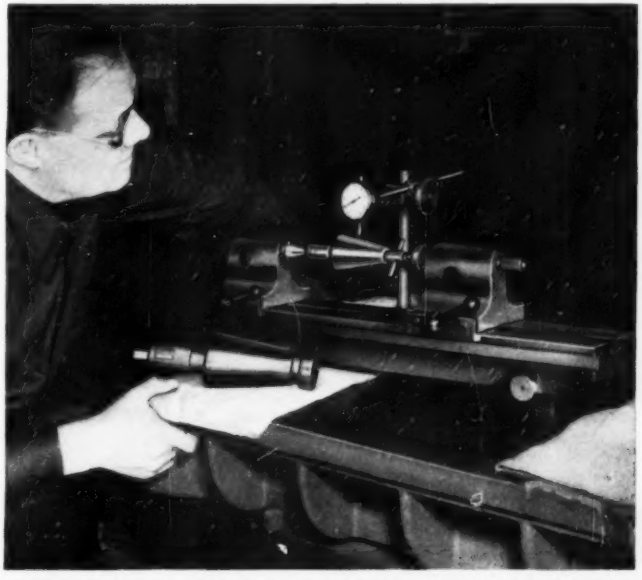
Common practice is to position the work horizontally in the fixture against the supporting knife-blades or screw points, and then slide the work longitudinally until the fixed horizontal knife-blade is contacted. If the taper is correct, according to the setting of the fixed knife-blade, no light shows between the blade and the work when the user looks down vertically along the contact line. The slightest difference in rate of taper permits a wedge of light to show between the knife-blade and the work. And the position of this light wedge indicates whether the large or small diameter of the taper is too small.

Illumination is obtained from a frosted tubular lamp bulb placed horizontally on the base of the fixture in approximate alignment with the fixed horizontal knife-blade. A slot is cut in the top plate of the fixture to permit light from the lamp to project upward across the edge of the knife-blade.

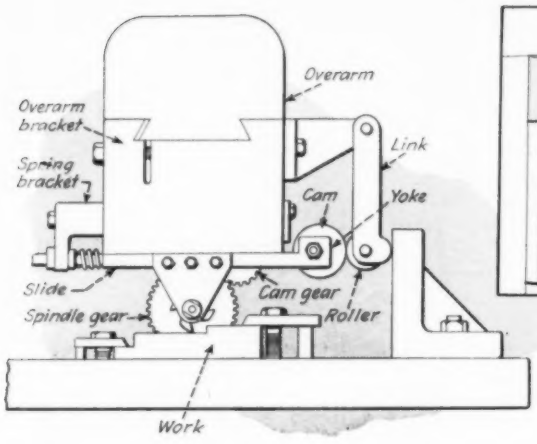


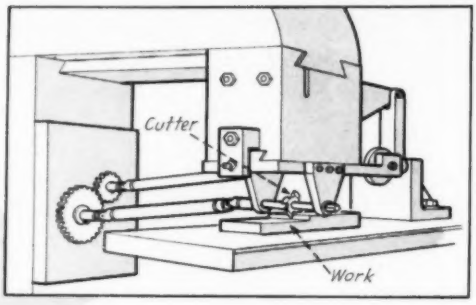


Three-bladed gage is easier to adjust than is gage having screws to support work. One blade is a fixed gaging unit; the other two are supporting elements to hold work against gaging blade. Adjustable horizontal blade is moved against master setting gage to fix correct alignment for taper to be checked. Blade then is locked in position. Knife blades are made of high-speed steel hardened to 60 to 62 R_c, then ground all over. Design of blade is common for all sizes of gage, length and width being changed to suit size of taper to be checked. Handles on opposite sides of baseplate make it easy to move gage wherever needed in shop. Original design is similar except screws support the work



Inspection setup for master setting gages employs 0.0001-in. indicator and a 20-in. sine bar. This method would be too expensive for production work from both time and cost point of view





Step-milling attachment on milling-machine overarm operates cutter arbor directly off spindle, while camshaft is geared to spindle to time slide movement with the stroke of each cutting edge

Back-Sliding Cutter Mills Tight Corners

Special attachments make possible

radical departures from standard milling practice in close quarters

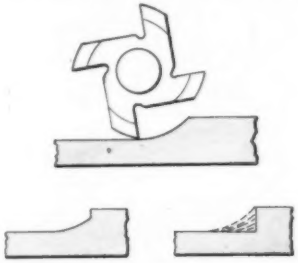
BY JOSEPH K. ROW

NORMALLY a cutter can't up-mill a radius smaller than the radius of the cutter itself . . . but an ingenious attachment added to a standard horizontal milling machine has made possible a radical departure from regular practice. The attachment runs a cutter with a small number of teeth—so one tooth will clear the work as the next starts into the cut—to cut right-angle corners with fillet radii as small as 0.005 in.

The trick lies in a secondary back motion of the cutter—controlled by gearing off the main spindle and synchronized with the cutter's strokes.

Two stub arbors are carried on a slide that moves parallel with the machine table. Both arbors—one for the cutter and one for the controlling cam—are powered from the main machine spindle through universal couplings to allow for reciprocation in relation to the overarm. A gear on the spindle runs another on the camshaft through a tooth ratio that is the same as the number of teeth on the cutter. This makes the cam complete a revolution in the same time one tooth replaces the one before it.

Slide support is through a heavy overarm bracket dovetailed to the overarm. A small bracket at the left end of the larger bracket holds a collar that guides a shaft from the slide. The compression spring works between the end of the slide and the collar. The cutter is supported in two journal bearings in plates bolted to the slide. At the right end of the slide, a yoke carries the camshaft, also in bearings, which supports a cam that controls the profile of the cut. The cam bears against a roller pinned in a swinging link that also contacts a heavy angle plate bolted down on the table.



Sample contours milled with back-up motion include any combinations of radius and right angle. Smallest radius that can be formed (0.005 in.) leaves only tiny fillet

Once the setup has been aligned, power feed moves the table over to the cutter until the plate moves the link to touch the cam. A trip dog on the table stops this motion when full engagement is reached. With the table fixed in position, the cam moves the slide against action of the spring to back off the cutter as it comes up out of the corner and to allow it to move forward as the next tooth starts cutting.

Cam layouts are determined by calculations or by the graphic method. The rise on the cam must be in exact relationship to the position of the cutter's teeth to pro-

duce the desired profile. Adjustments can be made by shifting the table and by rotating the cam in relation to the cutter's angular position.

In operation in a Toronto toolroom for over two years, the attachment has reduced die-milling time as much as 50 to 75%. The design was originated by Adolph Harvest, and has proved adaptable to many variations of right-angle cuts, as well as gang milling.

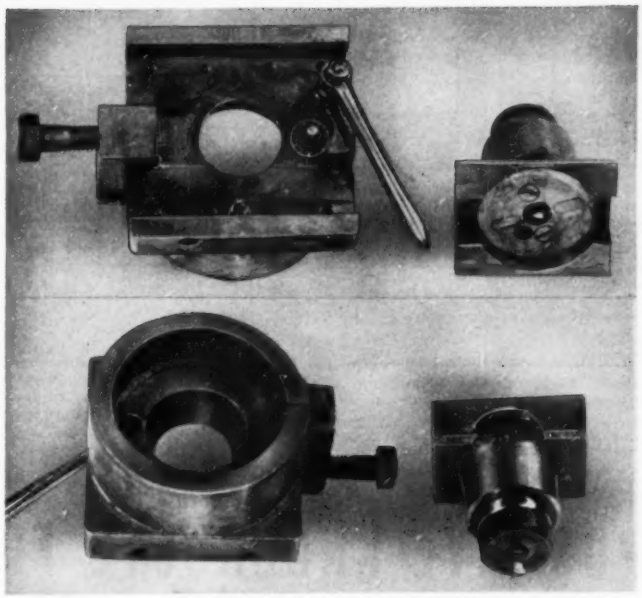
Vertical Corners

Operating on the same principle as the up-milling corner attachment, a version for a vertical miller cuts vertical corners with comparable precision. Here, again, a backup motion imparted to the cutter through a slide pulls it out of the corner to produce a clean, smooth-finished cut.

A machined casting fits on the nose of the machine and provides a base for the slide. On the slide is a chuck that grips the single-edge cutter and a cam that rotates with the chuck. Drive is through a driver sleeve that mates the spindle nose and has a slot in its lower face. A small dog slides in this slot and transfers rotary motion to an offset hole in the cam.

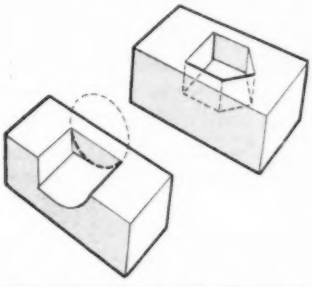
Spring loading for slide reciprocation is provided by a compression spring at one end of the casting. This is adjustable for pressure by a screw. The spring forces the slide, which is held against the casting by two bolted-on gibs, against a stub shaft that floats in a ball bearing at the other end of the casting.

Action is similar to that of the up-milling cutter. As the edge starts to cut into a corner, the cam moves the cutter closer until the apex of the corner is reached. At this point, the cam moves the cutter back out again, so the combination of rotary and reciprocating motions can be adjusted to form two straight edges of a corner.



Toolslide for cutting vertical corners mounts on vertical mill. Spring in block at left (above) forces cam in slide against cam-following roller at right. Handle controls slide position at start of cut. Action of slide and cam backs off cutter as it passes apex of corner

Although this second attachment has not been put into production, it has been subjected to extensive tests and produces work as good as the first attachment. If the milling machine is equipped with a taper attachment, the corner cutter will machine a tapered corner as well as a straight one.



Test cuts made in holes with V and circular bottoms were made at right angles, also angles larger and smaller than 90°

Advances in Hobbed Cavities for Plastics Molding

Hobs must be made with careful attention to proper drafts, uniform sections, rounded and filleted corners, and balanced proportions. Heat-treating is important, too, to provide maximum strength without making the hob brittle. Hobbers have turned to welding for repair work, which has proved quite satisfactory.

Alloy steel most commonly used for hobbed dies today has this composition: Carbon—0.08, Chromium—1.4, Nickel—0.5, Molybdenum—0.25. This steel has proved successful in injection, compression, and transfer molding. Hardness after carburization is 60 R_c. In a cross-section, the core will read 10 to 20 R_c, which is quite an improvement over the zero reading of the old Swedish iron.

A new steel for hobbed cavities contains: Carbon—0.10, Chromium—5.0, Silicon—0.20, Molybdenum—0.90, Manganese — 0.30, Vanadium — 0.35. This is an air-hardening steel. While the old Swedish iron was penetrated 1¼ in. by a standard hob with a standard pressure in a test, the common steel above was penetrated ¾ in., and the newer steel was only penetrated ¼ to ⅜ in.

Alloy steels have increased the cost of hobbed cavities, but when the cavity lends itself to hobbing, the cost is still less than more conventional machining methods.—John Sekowski, Midland Die Engraving Co., at SPI conference.

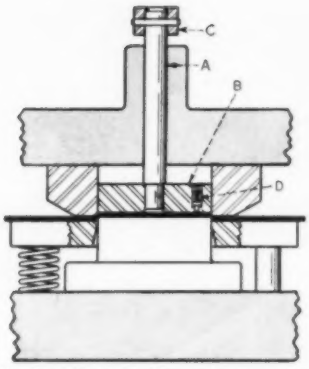


Fig. 1.. Blank ejection from the die opening of the inverted compound die is accomplished by a knock-out plate *B* and its shedder *D*

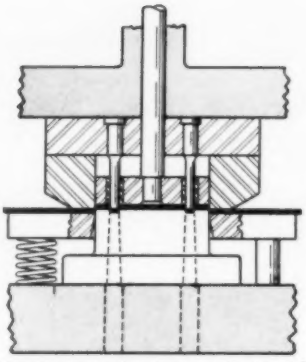


Fig. 2.. By making the knockout plate a close fit in the upper die, the plate (with bushings) can be used to support slender punches

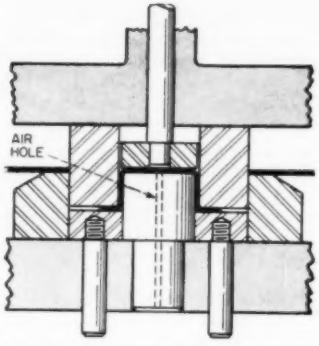


Fig. 3.. Upon completion, the flanged shell is carried upward in the upper die and is ejected by the positive knockout

POSITIVE KNOCKOUTS FOR DIES

One of the several designs described will provide positive part ejection, and be suitable for the production and accuracy requirements of the tool as well as shape of the part

BY J. R. PAQUIN, Tool Engineer
HARTFORD MACHINE SCREW CO.

POSITIVE knockouts possess several advantages over spring strippers where part shape and the die selection allow their use. Among these are:

1. **Automatic part disposal.** Since the blank is ejected near the top of the ram stroke, it falls in front of a jet of air which blows it to the back of the press and into a box. Or else, the press may be inclined and the same result obtained.

2. **Lower die cost.** Knockouts are generally much cheaper to build than spring strippers.

3. **Positive action.** Spring strippers occasionally stick, and a careless operator may continue to feed the strip. The resulting double-cut may cause extensive damage to the die or the press.

4. **Lower pressure requirements.** Since the ram does not have to compress heavy springs in its descent, less pressure is required to operate the press. Positive knockouts should be used for blanks greater in thickness than No. 16 gage (0.0625 in.) whenever possible.

Knockout for Compound Die

The simplest form of knockout, as applied to a plain inverted compound die, is shown in Fig. 1. It consists of the actuating plunger *A*, knockout plate *B*, and the stop collar *C* doweled to the plunger. Shedder *D* consists of a shouldered pin backed by a spring. The spring is confined by a setscrew.

In operation, descent of the press ram causes the upper die to compress the lower spring stripper and blank out the part. The ram then rises and, near the end of the upward stroke, plunger *A* contacts the knockout bar of the press. Continued upward movement of the ram pushes down the knockout assembly, ejecting the part from the die.

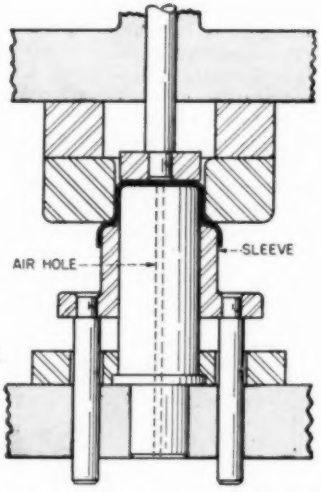


Fig. 4.. After redrawing, the sleeve strips the shell off the plug and pushes it into the upper die. At top stroke, the knockout ejects the shell

The shedder plays an important part in successful operation of the

knockout. The compounds employed to lubricate the strip often cause the part to stick to the knockout plate. When this happens, the shedder, located near the outer edge, "peels off" the blank from the face of the knockout plate. It then falls by gravity. Shedders should be applied to all knockouts.

Stop collar *C* is a safety device. If the press is tripped with the knockout bar set too low, the collar prevents fracture of the knockout mechanism.

The knockout plate provides an excellent means of guiding slender piercing punches. Fig. 2 shows two small punches guided in hardened bushings.

Blanking and Drawing Die

A positive knockout can also be applied to a combination blank and draw die, Fig. 3, for making a flanged shell. Operation of this die is as follows: Descent of the ram blanks the part from the strip. Continued downward movement of the ram depresses the pressure pad and draws the shell over the center plug. When the upper die rises, the lower pressure pad strips the shell from the plug. The shell is then carried up in the upper die and ejected at the top of the stroke by the knockout.

Redrawing Dies

A redrawing die, Fig. 4, is employed to draw a shell to a smaller diameter. In use, the shell is placed over the outer sleeve, which in its raised position is flush with the center plug. Descent of the upper die lowers the sleeve against the pressure attachment of the press. While the metal is ironed between the sleeve and upper die, the shell is redrawn over the center plug, as shown. Upon ram ascent, the sleeve strips the shell from the plug. The shell is now carried up in the upper die and ejected at the top of the stroke by the knockout.

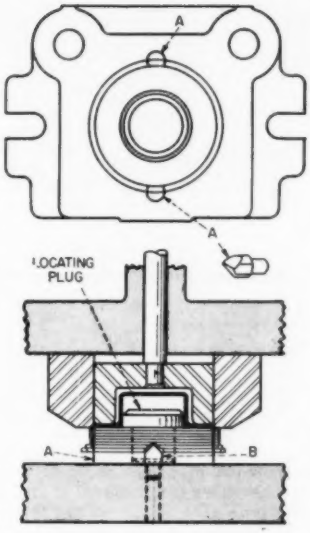


Fig. 5.. Knockouts for trimming dies bear only on the edge of the flange to avoid distorting the shell. Two scrap cutters split the scrap rings so they may be brushed away by the operator at his convenience

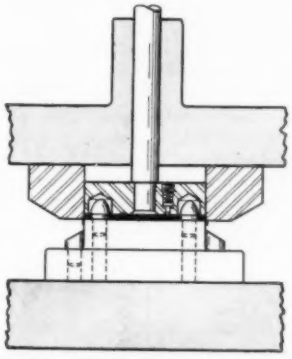


Fig. 6.. Shaving dies require a powerful knockout because of the high stripping pressure required

Trimming Operations

When applied to trimming dies for flanged shells, knockouts must be relieved to clear the shell, Fig. 5, to apply stripping pressure on the flange. Parts cling tightly in the die; if pressure is applied at the center of the shell, the part will be distorted.

No spring pressure pad is used at the lower part of dies of this type. The scrap rings, trimmed from the flange of the shell, slide down the lower punch *A*, pushed by the scrap ring being cut. Cutting pressure transmitted to the stack causes the lowest ring to be split in two by scrap cutters *B*, set at each side of the lower punch. The split halves fall to the surface of the die set, and are occasionally brushed off by the operator.

Shaving Operations

The tremendous pressures required to strip parts from shaving dies almost invariably dictate use of positive ejectors. The shaving die, Fig. 6, has two pilots which locate the part for the shaving operation. In descent, the upper die takes a shaving chip from the outer periphery of the part. These scrap rings are broken by scrap cutters, as in the previous case. The part is ejected by the husky positive knockout shown, which has been relieved to clear the upright pilots.

Construction Details

There are several ways of fastening the plunger to the knockout plate. Type *A*, Fig. 7, is most commonly used. A hole is reamed and countersunk in the plate. The plunger is turned down at the end,

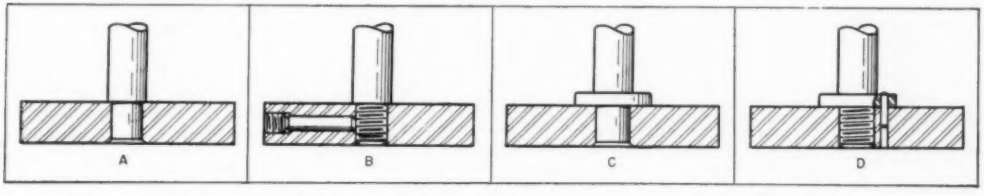


Fig. 7 . . Four methods are available for fastening the knockout plate to the plunger

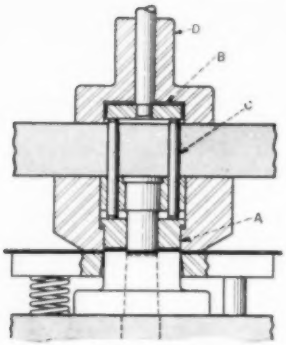


Fig. 8.. Because the punch is directly below the knockout plunger it is necessary to operate the knockout plug *A* by means of rods *C*

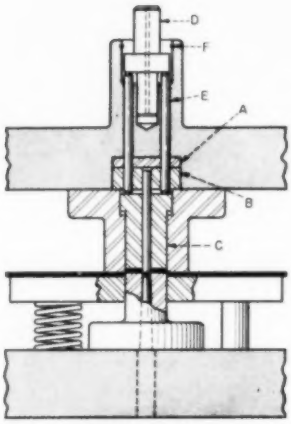


Fig. 9.. A good design for small work such as an instrument gear uses a shouldered plunger *D* to apply stripping pressure to the plug *C* by means of rods *E*. The knockout plug supports the slender piercing punch

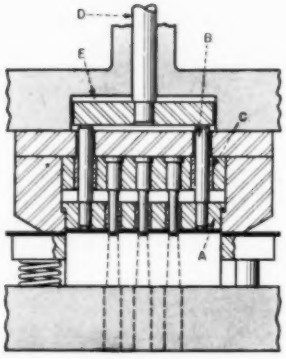


Fig. 10.. Knockout *A* is bushed for several piercing punches and is operated by rods *B* pressed into it

pressed into the reamed hole and peened over, as shown. This is an ideal method for low- and medium-pressure operations. At *B*, the end of the plunger is threaded into the plate. A setscrew applies pressure through a brass rod to lock it against rotation.

Shouldered plungers shown at *C* and *D* are preferred for high-pressure applications. At *C*, the end is peened over as in *A*, while at *D* the plunger is threaded and locked in place by a small dowel.

Indirect Knockouts

Where punches must be placed directly below the knockout plunger, auxiliary rods must be used to apply stripping pressure. These are called indirect, or plate, knockouts. In an application, Fig. 8, the knockout plug *A* is actuated by knockout plate *B* through rods *C*. Knockout plate *B* is set loosely into a recess machined in the false shank *D*, which is then screwed and doweled to the punchholder of the die set.

Another application of an indirect knockout is shown in Fig. 9. This die was designed to blank out a small instrument gear. The punch holder is recessed to contain the hardened back-up plate *A* and the punch plate *B*. Knockout plug *C* supports and guides the piercing punch. Pressure is applied to the knockout plug by the shouldered plunger *D*, through the rods *E*. The plunger is retained by the wire ring *F*.

Applying Punch Support

The guide knockout illustrated in Fig. 10 is used for larger blanks, in which a number of small holes must be punched. Hardened bushings, pressed into the knockout *A*, support and guide the punches. Rods *B* are pressed into this knockout plate and are guided in bushings *C* pressed into the punch plate. Stripping is effected by pressure transmitted by the knockout plunger *D*, through plate *E* and rods *B* to the knockout plate *A*.

Plates for Indirect Knockouts

Knockout plates shown in Fig. 11 are suitable for small dies. The rectangular plate *A* is used with four rods. A triangular plate is employed when only three rods are to be applied to the die. All knockout plungers should be fitted with a stop collar, as mentioned earlier. Merely pressing a pin through the plunger as shown at *C* is not enough, because this pin can be sheared off easily under the extreme pressure applied by the press knockout bar when it is set too low. Three rods, as shown at *B*, are the minimum number that can be used for stability. In large dies, the plate is cut into a spider shape, as shown in Fig. 12, to re-

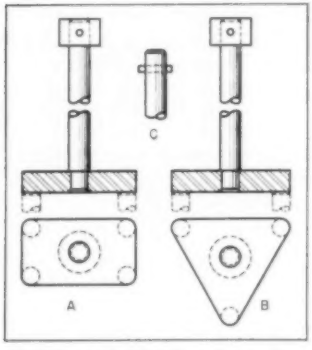


Fig. 11.. Plates for indirect knockouts should bear upon at least three rods for stability. A stop pin, as at *C*, should not be used

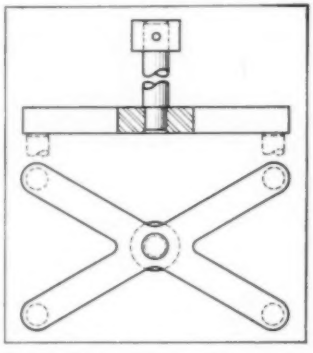


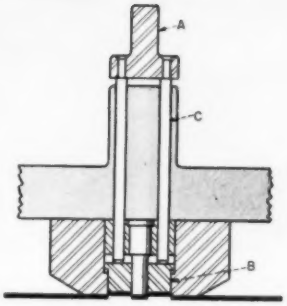
Fig. 12.. Spider-shaped knockout plates are used in large dies and are guided in a corresponding opening end-milled in the die-set punch holder

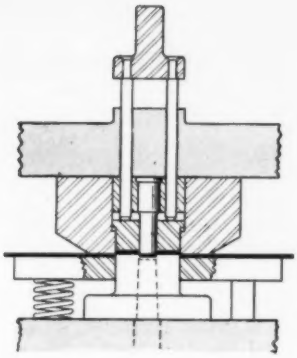
duce weight. A recess is end-milled in the punch holder of the die set, slightly larger than the spider. In use, the spider is free to move up and down within this recess.

To Lower Costs

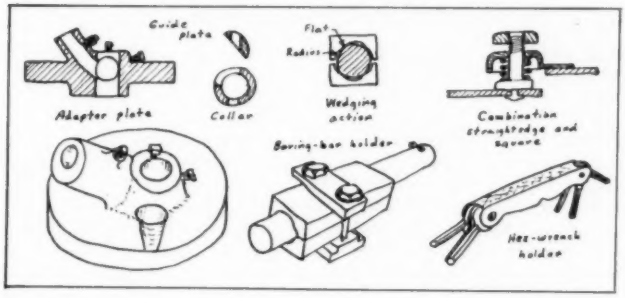
The indirect knockout shown in Fig. 13 is lower in cost than those previously described, because its construction is not so elaborate. A flanged plunger *A* transmits stripping pressure to the knockout plug *B* through rods *C*. The design is not as good as previous constructions, and it should be used only for low-production dies; never on first-class press tools. Fig. 14 shows the same design applied to a die where the press opening is not large. Here, the punch holder shank has been almost machined off, leaving only enough of it for centering the die. The punch holder is then bolted to the ram.

One of the knockouts described will be applicable to almost any die requiring positive means of part ejection, and the selection depends on the requirements for production and accuracy.





Figs. 13 and 14.. These are cheaper methods of applying indirect knockouts to press tools, and their use should be confined to low-production dies



Inventors Show Turns Up Toolroom Ideas, Tools and Fixtures

Unusual shop tools were included at the International Inventors' Exposition in New York City.

One was a method of machining slanted toolbit holes in the ends of boring bars. Instead of fussing around with drills and files, the inventor broaches the slanted holes with a special adapter plate that fits on a pull-type broaching machine. Three holes—one horizontal, one vertical, and one slanted at the correct angle for the toolbit hole—intersect in the middle of a cast-iron adapter plate. The boring bar is inserted in the slanted hole, inside an adapting collar if its size is under the bore of the hole, and its end falls into the intersection of all three holes. A cut-out collar slips into the horizontal hole to retain a semi-circular-section plate that is pierced to the standard square section of a toolbit. This plate is hardened, and guides the broach in front of the hole in the bar.

Broaching bushings are mounted in the vertical holes to guide the broach until it reaches the plate. Finally, the boring bar and all adapters are locked tight with setscrews, and the adapter is ready for the machine.

Finished boring bars showed excellent results. The holes were accurate and the finish was good.

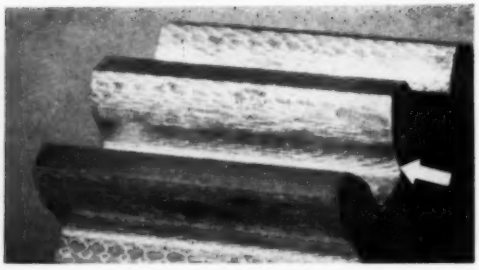
Boring-bar holders made by the same inventor were interesting too. Clamping directly on the cross-slide of the machine, a channeled plate carries two long jaws that are held by heavy bolts to the plate. The clamping profile inside the jaws is a combination of a circle and a V. Actually the flat spots inside the jaws grip the round boring bar with a wedging action.

A combination tool that was both a straightedge and a square was exhibited by another shop inventor. Two straightedges in this tool are held together by a spring-loaded joint that permits shifting the edges into a straight line or to a right-angle position. Adjustment of the nut on top holds the edges firmly together in either position.

Hex wrenches are kept together in a convenient jacknife holder invented by another mechanic. Five wrenches cover most common hex-head screw sizes.

Another exhibit presented a gear-and-pinion adjustment for dial indicators. An indicator is clamped on the adjustment mechanism so it touches the work to be checked; then final adjustments are made by turning a thumbscrew on the mechanism that moves the indicator through a 50-to-1 gear ratio.

These inventions are patented and most of them are up for sale.



Generating steps on flanks of teeth on gear at left are positioned the same on all teeth and are alike as to size and depth, while those of gear at right are much smaller and broken up, producing a much smoother and desirable finish. Both gears are six pitch, have 15 teeth, and were hobbed at 0.050-in. feed with a double-thread hob. For gear at left, hob tooth was centered on gear and number of gashes was an even multiple of number of threads. In gear at right, number of gashes was an uneven multiple of number of threads

HOW DO MULTIPLE-THREAD HOBS BEHAVE?

PART 2

Checklist shows effect of all combinations of major hob elements on gear-tooth form, spacing, and finish

BY J. P. BREUER, Hob Engineer

BARBER-COLMAN CO.

ALTHOUGH proper application of multiple-thread hobs results in appreciable production increases, these hobs cannot be applied haphazardly to all jobs. In addition to variables that must be analyzed in any hobbing application, multiple-thread hobbing requires consideration of the number of teeth in the gear in relation to number of threads and number of gashes in the hob. For convenience of analysis, these relationships may be expressed as general ratios and for each ratio the effect on gear tooth quality may be determined.

In multiple-thread hobbing, six major combinations of hob-element ratios occur. Each influences the product in a predetermined way:

(1) **When the thread-gash ratio and the thread-geartooth ratio are each "even"**: (a) Index errors and profile errors in particular threads act upon particular teeth spaced around the gear in groups consisting of a number of teeth equal to the number of threads. (b) Generating flats are of maximum size, alike on all teeth, and are positioned the same on both sides of all teeth, providing the hob tooth has been centered.

(2) **When the thread-gash ratio is "even" and the thread-geartooth ratio is "hunting"**: (a) Index errors of all threads act upon each and every tooth in the gear, cancelling one another in such a way as to produce maximum tooth-spacing accuracy. (b) Profile errors in all threads act upon each and every tooth in the gear so the profiles of all teeth are uniform. (c) Generating flats are of maximum size, alike on all teeth, and are positioned the same on both sides of all teeth, providing the hob has been centered.

(3) **When the thread-gash ratio is "even" and the thread-geartooth ratio is "common-multiple"**: (a)

HOB ELEMENT RATIOS

EXPRESSION	QUOTIENT	Name of Ratio	EXAMPLE Gear Teeth	Hob Threads	Ratio
number of gear teeth / number of hob threads	whole number	even	12	4	3
	mixed number, but expression has a common denominator	common-multiple	10 (multiple = 2)	4	2½
	mixed number, but expression has no common denominator	hunting-tooth	11	4	2¾
		Name of Ratio	Hob Gashes	Hob Threads	Ratio
number of hob gashes / number of hob threads	whole number	even	2	2	1
	mixed number	uneven	3	2	1½

Index errors of alternate threads act upon particular teeth spaced around the gear in groups consisting of a number of teeth equal to the lowest common multiple. (b) Profile errors in alternate threads act upon particular teeth spaced around the gear in groups consisting of a number of teeth equal to the lowest common multiple, making alternate groups of uniform teeth. (c) Generating flats are of maximum size, alike on all teeth, and are positioned the same on both sides of all teeth, providing the hob has been centered.

(4) **When the thread-gash ratio is "uneven" and the thread-geartooth ratio is "even":** (a) Index errors and profile errors in particular threads act upon particular teeth spaced around the gear in groups consisting of a number of teeth equal to the number of threads. (b) Generating flats are of maximum size, alike on all teeth, and are positioned differently in groups equal to the number of threads in the hob.

(5) **When the thread-gash ratio is "uneven" and the thread-geartooth ratio is "hunting":** (a) Index errors of all threads act upon each and every tooth in the gear, cancelling one another in such a way as to produce maximum tooth-spacing accuracy. (b) Profile errors in all threads act upon each and every tooth in the gear so profiles of all teeth are uniform. (c) Generating flats are of minimum size.

(6) **When the thread-gash ratio is "uneven" and the thread-tooth ratio is "common-multiple":** (a) Index errors of alternate threads act upon particular teeth spaced around the gear in groups consisting of a number of teeth equal to the lowest common multiple. (b) Profile errors in alternate threads act upon particular teeth spaced around the gear in groups consisting of a number of teeth equal to the lowest common multiple, making alternate groups of uniform teeth. (c) Generating flats are of neither maximum nor minimum size, but are alike on alternate teeth in a group equal to the common multiple.

VARIATIONS FROM TRUE INVOLUTE ON TEST GEARS

(Readings in 0.0001 in.)

Position on Involute	Gear A, 24 T								Gear B, 25 T			
	Tooth No. 1		Tooth No. 2		Tooth No. 3		Tooth No. 4		Tooth No. 1		Tooth No. 2	
	R	L	R	L	R	L	R	L	R	L	R	L
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	+2	+2	+1	0	+3	+2	+1	+2	+1	+2
3	+2	+2	+8	+3	+2	+1	+10	+3	+2	+4	+3	+3
4	+2	+2	+10	+2	+3	+1	+11	+2	+2	+2	+3	+2
5	+4	+2	+9	+3	+3	+2	+10	+2	+2	+1	+2	+2
6	+4	+5	+6	+1	+3	+4	+7	+2	+1	+2	+1	+3
7	+5	+6	0	+1	+5	+7	0	−1	+2	+3	+1	+3
8	+10	+4	−2	−1	+10	+5	−1	−2	+2	+3	+1	+2
9	+11	+5	−1	−4	+10	+5	0	−3	+1	+3	0	+2

Readings of an involute check over several adjacent teeth on each of two gears cut with a double-thread hob, 10 gashes, show that the profiles are alike on all teeth of the 25-tooth gear because of the "hunting-tooth" action. On the 24-tooth gear profiles are alike in groups of two

As one illustration of some of the above generalizations, two gears were cut in the Barber-Colman Gear Laboratory. Gear *A* is a 24-tooth, 6-pitch gear, while gear *B* is a 25-tooth gear of the same pitch. Both gears were cut with the same double-thread hob, a ground class "*B*", having 10 gashes. On gear *A*, where the number of teeth is an "even multiple of the number of threads, the tooth profiles are alike in groups, *i.e.*, tooth numbers 1 and 3; 2 and 4. On gear *B*, where there is a "hunting-tooth" ratio, all profiles are alike.

It is interesting to observe how the "hunting" action has improved the involute profile of gear *B*. Analysis of readings shows that this was undoubtedly the result of a combination of thread spacing and lead errors cancelling one another. For instance, high spots such as shown in the plus readings on positions 7, 8, and 9 of tooth number 1, gear *A*, were negated by the teeth on the hob thread that produced opposite errors for the same positions in tooth number 2 of gear *A*. As the low readings were not as great as the high readings, the thread-spacing errors were not complementary to a degree where all of the high spots were removed by the "hunting" action on gear *B*. Hence, there are readings from 0 to +0.0003 in. for the same positions on the involute for gear *B*, instead of +0.0004 in. to +0.0010 in. or −0.0001 to −0.0004 in. as on adjacent teeth in gear *A*; described above.

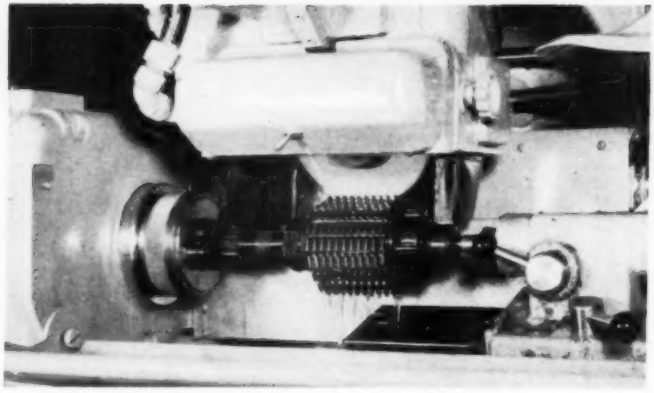
The manner in which the number of gashes in the hob affects the finish of the cut gear is illustrated in the double photograph. As it is difficult to show generating flats on the faces of the teeth, the photographs are of the undercut pattern, or the generating steps, on the flanks. Obviously, few gears are designed with undercut. However, the caption information may actually be applicable in a few cases, where a long addendum tooth form cannot be used, because of rigidity of existing gear designs.

Conclusions

Analysis of the above elements of multiple-thread hobs leads to no iron-clad set of rules that can be applied in all cases. Each individual case must be studied separately and requirements for finish, tooth spacing, or involute, will in the last analysis, dictate the combination of threads, gashes, and number of teeth that best suits a particular situation.

In the best possible tooth-spacing accuracy is desired, the "hunting-tooth ratio may be selected because each hob thread will then act upon each and every tooth in the gear in such a way that the index errors cancel one another.

Generally, tooth profile will be about the same, regardless of the ratio used. However, in some cases such as described above, errors in thread spacing on the hob may neutralize each other when the threads "hunt." Therefore, although this is a matter of speculation for any particular problem, the chances are always present that



Sharpening multiple-thread hobs should be performed before dullness becomes excessive. When stock removal is at a minimum, the best cutting surface and finish are obtained

involute will be better using the odd thread-geartooth ratio instead of an even ratio.

One point of caution should be made here, however—the hob must be perfectly trued on the arbor, for eccentricity will produce high and low teeth if the number of threads is a multiple of the number of teeth. This produces varying tooth thicknesses, with corresponding variation in backlash at a given center distance between adjacent teeth.

In most cases the even-ratio spacing errors are greater and cause more trouble than profile errors. Furthermore, it is more difficult to correct errors in spacing by shaving or grinding.

On hobs of 20 pitch or finer the spacing from thread to thread will be good, and the effect on the profile of teeth hobbed with a prime ratio of threads to teeth will be very slight. But in hobbing coarse-pitch gears, where the thread-spacing errors on the hob are apt to be greater, poor spacing and variations in form are frequently more serious.

Sources of Error

The same errors that result from careless use or improper sharpening of single-thread hobs also apply to multiple-thread hobs. However, these errors are sometimes magnified and new errors are often introduced because of the relations already discussed.

The most common and perhaps the most serious fault encountered in the field with multiple-thread hobs is runout. If a multiple-thread hob cutting a number of gear teeth that gives an "even" thread-geartooth ratio is mounted with uniform eccentricity, or similar runout on both ends, the effect is alternately high and low teeth on the gear. If, however, a "hunting-tooth" ratio exists, errors introduced by the high and low cutting teeth are negated by the "hunting-tooth" action and the end result is uniform gear teeth and a concentric pitch line. The same principles apply, though in a more complex manner, if the hob runs out on one end only or on both ends in opposite directions.

Hob runout also affects the size of the feed pattern where the "hunting-tooth" ratio is used. For example, if a double-thread hob runs out, one thread cuts high and the other cuts low. The low teeth leave stock in the gear-tooth profile but this stock is generated out on the succeeding revolution by high teeth on the opposite thread. The resulting feed pattern, therefore, is equal in length to twice the amount of feed used. Of course, this condition is further exaggerated as the number of threads in the hob is increased.

Therefore, it is important that multiple-thread hobs run absolutely true on the arbor and that the arbor or hob spindle be in proper adjustment. In fact, it cannot be too strongly recommended that only taper hole hobs are specified with multiple-threads.

Swivel Setting Adjustment

As on all hobs, the diameter of a multiple-thread hob decreases with each re-sharpening, because of the cam, with a corresponding increase in the thread angle. This change in thread angle does not affect the quality of the gear teeth produced and usually the hob can be set at the original setting angle as marked on the hub.

On some applications, however, after the hob has been sharpened back considerably, it may be necessary to alter the swivel setting slightly to maintain an adequate cutting clearance on the sides of the hob teeth. The following formula should be used in figuring this new setting angle:

$$A = \frac{P \times N}{C}$$

Where:

A = sine of the thread angle
P = normal circular pitch of hob or gear
N = number of threads in hob
C = Pitch circumference

And

$C = (O - 2S)$

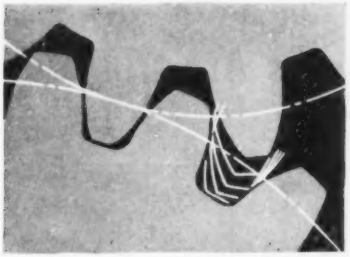
Where, O = OD of hob, and
$S = S$ & f on gear (Dedendums)

Sharpening Multi-thread Hobs

The same errors result from improper sharpening of multiple-thread hobs as result from improper sharpening of single-thread hobs but the effects are exaggerated because of the fast lead and the fewer teeth in action. Additional errors are sometimes introduced, depending on the thread-geartooth ratio.

Inaccurate indexing and eccentricity of the hob during the sharpening operation produce a high and low tooth condition, resulting in unsymmetrical tooth forms, and spacing errors where the even thread-tooth ratio exists. This condition is aggravated as the number of threads is increased.

Likewise, the higher thread angle of multiple-thread hobs results in a greater error in tooth form for a given error in the face angle as the generating flats are larger because of the fewer teeth in action.



Modern Gear Cutting Equipment

. . A SUMMARY OF PRINCIPLES, TYPES, CAPACITIES

BY CHARLES G. PFEFFER, Gear Engineering Consultant

A WORLD which moves on wheels requires gears of many sizes, shapes and capacities. Every mill, mine and factory uses gears in some form or other to produce—or in—its product. The automobile, the locomotive and the airplane could not have reached their present perfection without the parallel development of the gear. The electric clock was made possible by a 1-cu in. unit containing 14 gears, and the great turbines and mill machinery by gears up to 200-in. dia.

Modern gears must operate at high speed, sustain heavy loads, use a minimum of space, be quiet in operation and be smooth running. They are the gradual evolution of the constant search for better quality from the time when Aristotle wrote about transmitting uniform motion as early as 300 B C.

Some idea of the latest types of machines for making gears is given here, with pictures of typical ones. Later reports will cover gear finishing and inspection equipment.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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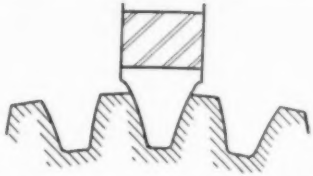
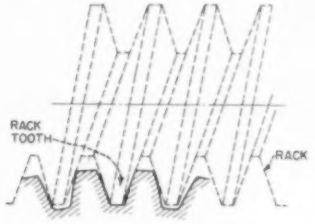
Gears Are Old, But Precision Gears Are New



Original form-milling cutter produced the space between the gear teeth and was advanced through the blank to form each space individually, then indexed to cut the next adjacent space parallel to the axis



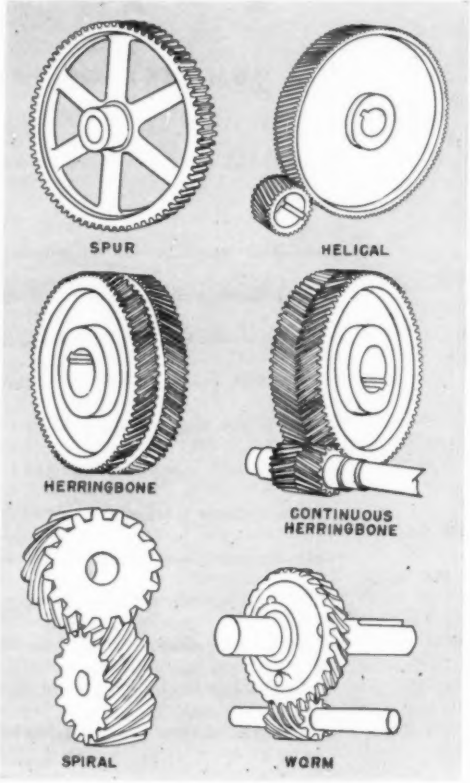
Generating principle has taken two forms as developed from the basic rack which, when wound around a cylinder maintaining uniform pitch and lead, became the hob, and when wound around a disk, the shaper cutter

IN 1674, scientists and mathematicians proposed the epicycloidal form for gear teeth. About twenty years later, the involute theory was developed, but its practical application did not take place until 1832. Many other form curves for gear teeth have been proposed since then, but the involute has become universally used as it is the simplest to produce, can be readily measured, transmits uniform motion, and its flexibility characteristics provide an ideal form for gear teeth.

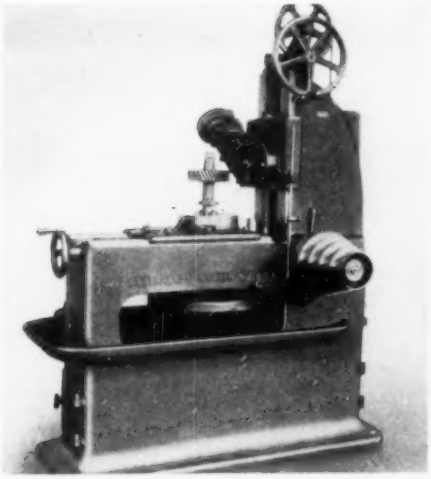
Gears in their earliest practical form were cast from a wooden pattern. Therefore, selection of tooth proportions was governed entirely by the production methods available. Cast teeth were crude and inaccurate, and necessitated gears of considerable size to meet load requirements. Advanced methods make possible cast gears of better quality, but they are used only where cost is of prime importance and where noise, strength and size are not factors.

The next stage in the search for better-quality gears was the introduction of the form-milling cutter in 1864. This made automatic gear-cutting machines possible. As each change in tooth numbers, however, altered the form of the required space slightly, it was necessary to produce special cutters for each gear, or use a range cutter of a series which produced the average tooth space within the number of teeth specified by that particular range.

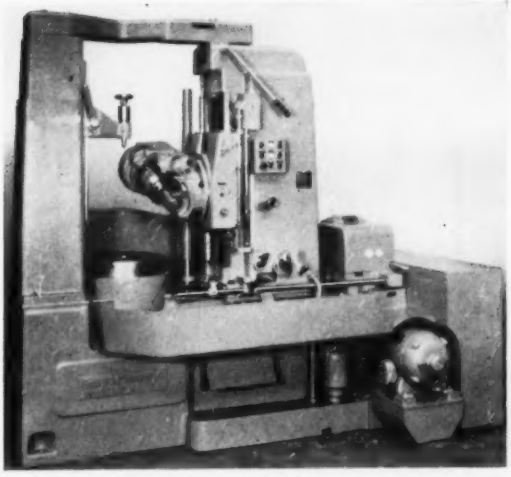
This method of producing gear teeth was used for many years until the molding generating, or generating, principle as it is termed today, was developed. This development opened the way for



Hobbing machines can be applied economically to the manufacture of all the various types of gears shown here, although other production methods can be equally well employed for some of them



One of the earliest hobbing machines was built by Gould & Eberhardt in 1905 for hobbing gears by the non-differential method. Although crude in appearance when judged by present-day standards, it embodied many of the basic principles still used in modern machines



Latest type of Gould & Eberhardt 24H universal manufacturing hobbing machine for spur, helical, double helical and worm gears is adaptable to a wide variety of gears with minimum of tooling requirements. It is available in various sizes, the largest taking spur gears up to 90 in. in dia and 24-in. face width. Dual-lead worm gearing for table drive permits axial adjustment of worm, without disturbing center distance or affecting transmission of uniform motion. This provides means for adjusting backlash for various operating conditions and to take up wear

better rolling action and tooth contact and also made possible the production of helical, herringbone, internal gears, and generated worm gears.

With the necessary geometrical corrections and the provisions for the cutting surface, these tools produced gear teeth of conjugate form, and the same cutting tool could be used for any number of teeth which would roll together correctly. The principle of these cutting tools is identical with that used today. The progress of development and improvement has centered entirely on methods, material and equipment for producing and measuring cutting tools of greater accuracy, uniformity and hardness.

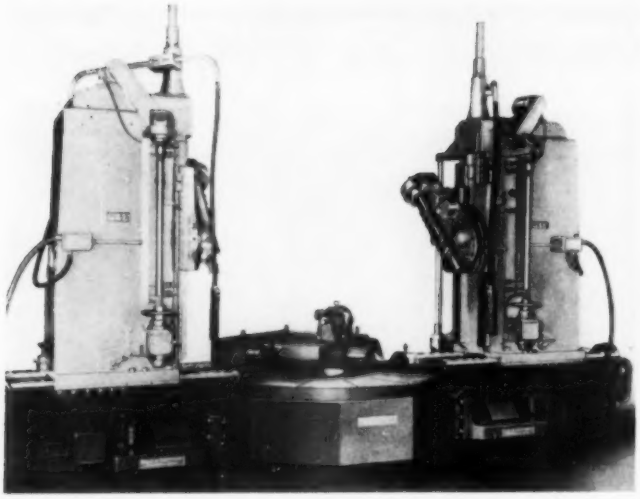
Modern cutting tools are within limits measured in tenths of thousandths. To use tools of such accuracy efficiently and economically, the machines must also be accurate, rigid in construction to maintain such accuracy, and easily accessible for rapid production.

GEAR HOBBING MACHINES

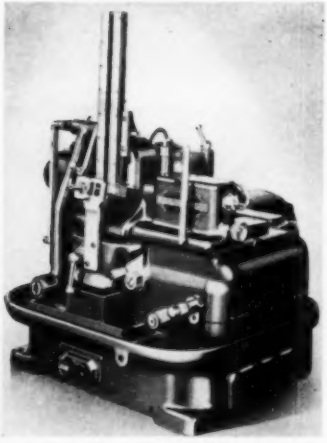
One of the first machines for generating gear teeth was the hobbing machine. In theory, the principle of this method was known and proposed about the same time as the form cutter was developed, but the practical application followed many years later.

Today, it is one of the most widely used methods, and hobbing machines are produced by several builders in both standard and special types. An example of the latter is a special adaptation of a standard machine for high production hobbing automobile steering worms, built by Gould & Eberhardt as Type HW. A special helicoidal cutter is employed with roughing and finishing teeth, and takes the form of a hob by the use of about 1½ convolutions of teeth, making the hob length about twice the normal circular pitch. The design and arrangement of the hob teeth provide for progressive metal removal and distribute the cutting action over all teeth. Machine is geared for the number of teeth to be cut, eliminating all hand indexing. Worms produced by hobbing are accurate, and the continuous cutting action permits a high production rate. This is particularly important in the automotive industry.

Gould & Eberhardt type TWG is another ma-



Single and double helical reduction gears for high-speed turbines requiring quiet, smooth operation, may be cut on G & E 120 H and 160 H machines. Primary index drive is coarse pitch for roughing and truing the blank, secondary drive for finishing only is fine pitch. Drives are synchronized, but only one functions at a time, the other being automatically put into the idle postion. Dual-lead worms allow adjustment for wear and maintaining proper backlash



Barber-Colman type 1x½ (formerly designated as type S) for high production of small spur gears up to 1-in. dia and ½-in. face width. Fully automatic cycle includes work loading from magazine, rapid approach to hob, feed, quick return and ejection. Gear teeth of 180 DP with hobs of ground form, and 205 DP with unground form have been cut on this machine, which is mostly used as a bench machine

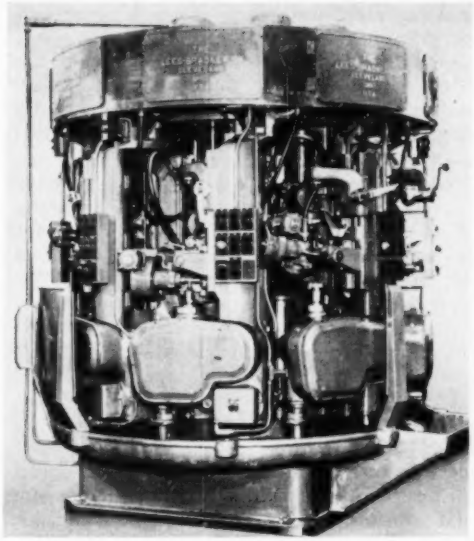
Vertical hobbing machine type 8-10 is latest Barber-Colman design for mass production. Operating cycle is fully automatic and combines hydraulic pressure for actuating hob carriage, clutches and clamping, mechanical drive to hob spindle and screw feed, and electrical to hydraulic pumps and rapid traverse. Micrometer stops are provided for exact duplication on long runs. Design conserves floor space and permits ready accessibility from the front without sacrificing rigidity

chine for hobbing worm gears. The hob spindle has an angular adjustment of only 5° each side of horizontal, permitting a low, massive, supporting column. Feed is available in either direction, and the machine has automatic infeed with micrometer stop and a resetting device for registering the hob with worm gear teeth previously roughed out as a preliminary operation. Index plates for multiple threads to be cut by the fly-cutter method, and dual-lead worm gearing, are important features. Sizes range from 12-in. max dia, ¾-in. circular pitch, for the 10 TWG to 84 in. and 3-in. circular pitch for the 70 TWG.

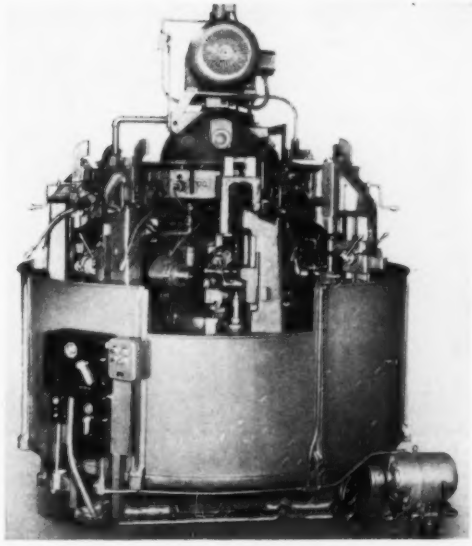
Gould & Eberhardt also produced the first ground-form hob in this country by the use of a pencil wheel.

The basic hobbing principle is also employed by other machine builders, notably Barber-Colman, Lees-Bradner, and Cleveland Hobbing Machine, although the machines themselves are quite different in operation and general appearance. Each machine has certain distinctive features which may be exclusive to that particular make.

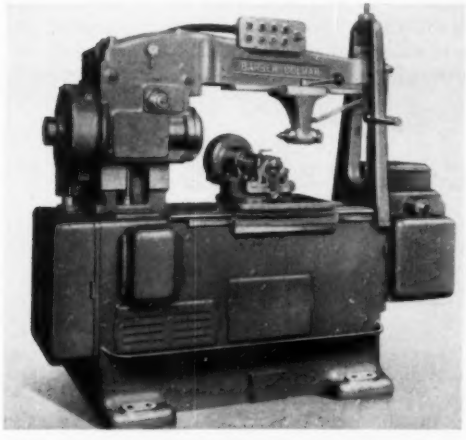
For high production of small gears such as those in meters, clocks, watches and cameras, the Barber-Colman Type 1x½ has fully automatic operation. It is a complete unit with built-in motor and lubricant and coolant pumps.



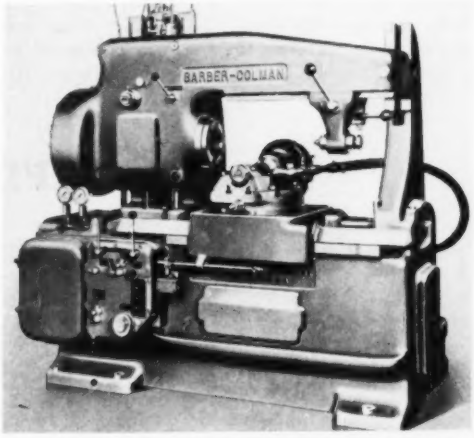
Multi-spindle hobbing machine by Lees-Bradner has independent spindles which can be set up for similar or different cycles and gears, with work table stationary or rotating. "In series" feature of headstock drive simplifies calculations when cutting helical gears with a non-lead differential drive. When helical gears are the principal requirement, a lead-differential headstock is available. Power rapid traverse is through differential, eliminating clutches



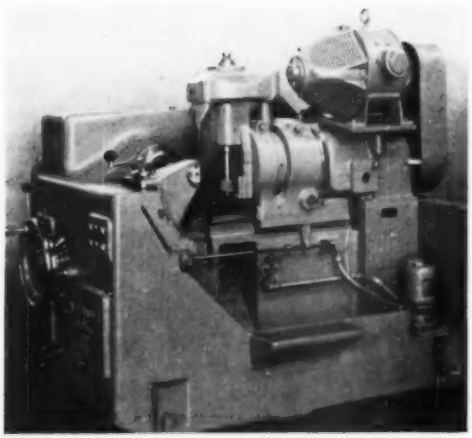
Cleveland rotary hobbing machine designed for mass production. This machine is available in a single-spindle model, or with 4, 6, or 8 spindles and is widely used in the automobile industry. Maximum rigidity is insured by the "O" type of frame construction and by supporting work head above and below work. Head moves vertically and hob cuts against its entire weight, eliminating backlash between leadscrew and nut. Arbor has six rows of ball bearings



Universal hobbing machine, Barber-Colman type 16—16 for spur and helical gears and splines will handle 10-in.-dia gears of 8-in. face width and will swing 16 in. under overarm. New feature is backlash eliminator and adjustment operated from hob carriage. Hob rotation can be reversed for climb hobbing. Infeed can be by cam which automatically returns work slide to starting point, or by power feed which requires manual return. Hob swivel attachment is available for high helix angles



Heavy-duty Barber-Colman type 14-15 features hydraulic pressure for actuating, feed, rapid traverse and clamping of operating units. Operating cycle is automatic and consists of approach, clamping, feed, receding, quick return and stop. Disconnection of feed at the end of cut also stops work spindle, hob spindle and coolant flow. Differential for hobbing helical gears is standard equipment on this machine



Lees-Bradner 5B hobbing machine will produce spur gears, helical gears of any angle, worms and worm wheels, and threads, with single cutter or hob. Machine has a capacity of 20 in. in dia and 10-in. face width, and has two drives. Worm and worm wheel are available for slow speeds and heavy cuts, and a spur gear train for lighter pitches and finishing cuts. Either drive may be simply engaged by the drive selector lever

The Type 16-16 has interlocking selector switches centrally located on the overarm, and incorporates a new method for feed control and hob carriage traverse. Adjustable dogs are mounted on a dial on the feed box calibrated in inches of travel. Settings may be selected for feed and rapid traverse in either direction and for stopping the machine at the end of the cut.

Lees-Bradner 5B machine is the latest version of the parent model 5, built in 1905. Each new version has added some element to produce gears of greater accuracy more economically. In this model, hob spindle speeds can be set at the desired rpm by a "Power Pack" unit which gives the advantages of ac power supply and the flexibility of dc speed regulation. Calculation of change gears is unnecessary, and mating helical gears can be cut by changing index gears. Power wormwheel infeed unit permits the hob to remain at depth position for a cleanup cut around the gear before the machine is brought to a stop.

Also produced by Lees-Bradner is the model 7A rotary machine which is available as single-spindle, or 4-, 6- and 8-spindle with a capacity up to 8-in. dia and 9-in. face width. All functions are electrically controlled by pushbuttons at operator's position. Electric hob shifter has micrometer dial to insure exact distance of shift. Automatic hob in-and-out mechanism advances hob to depth and out at completion of plunge-cuts. Various cycles are possible, as, advance, feed, out and quick return to starting position, or feed in, feed out, and quick return.

Another rotary machine is that produced by Cleveland Hobbing Machine Co. It is available in 1-, 4-, 6-, or 8-spindle models and is an unusually rigid machine with the ability to maintain accuracy over long periods of mass production. Hob is shifted by loosening two bearing clamping nuts and turning the squared end on the arbor. Micrometer dial indicates the amount of axial shift.

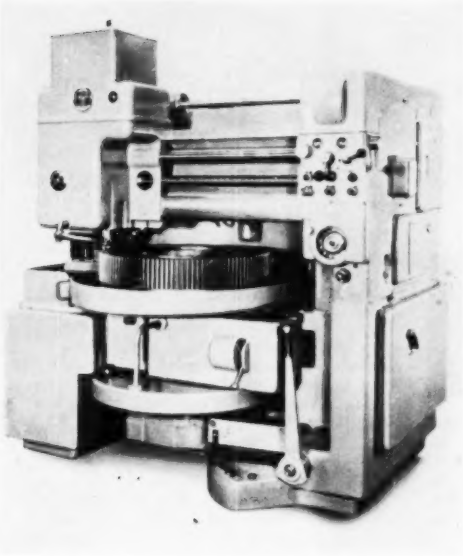
GEAR SHAPING MACHINES

IN 1897, Edwin R. Fellows, founder of the Fellows Gear Shaper Co., built the first gear-generating machine using a disk or gear-like cutting tool with relieved cutting edges. The tool rotated and reciprocated to produce a generated gear tooth of involute form.* This principle remains the basis of all gear-cutting equipment produced by the company today. Further development has extended the range from spur gears to helical, double helical and internal gears and many other generated forms in range from ⅛-in. dia and ¼-in. face to 100-in. dia and 6-in. face. E. R. Fellows was also the first to produce a hardened and ground shaper cutter and the machine to measure its involute contour in the year 1906.

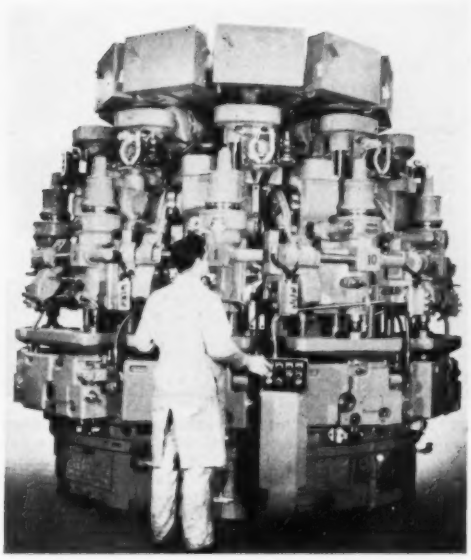
In these machines two independent motions are provided for depth and rotary feed. Depth feed advances the cutter to the work and rotary feed is effected by relative rotation of work and cutter. The cutter feeds automatically to roughing depth and, after one revolution, is advanced to the finish depth. Machine stops automatically when gear is completed.

Another type of generator using a rotating and reciprocating disk-type cutter is the Sykes machine built by Farrell Birmingham. This is so designed that by alternate successive cuts on each helix and increasing the depth of cut after each rotation of the blank, the material at the center is removed gradually and the cutters are

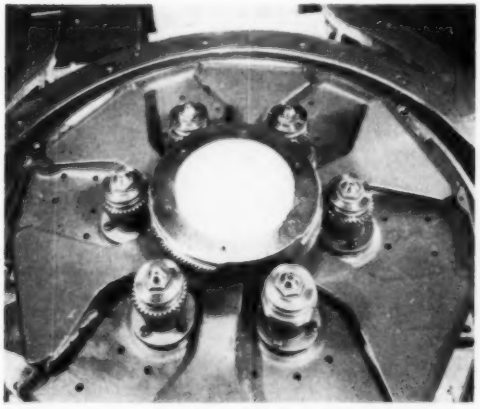
* This machine is now at the N.Y. Museum of Science and Industry and is still operating.



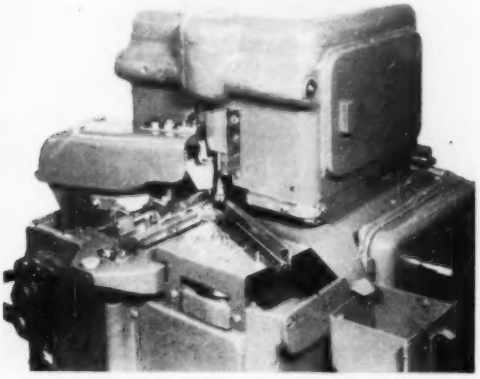
Latest design of the Fellows 36-in. gear shaper. This is a standard machine for production work and differs from others of its type only in the matter of size. Its use is not restricted to plain spur gears but, like other Fellows machines, can produce internal gears, gear segments, interrupted gears, cams, pawls, and a wide variety on other regular and irregular internal and external forms by the selection of specially shaped form cutters



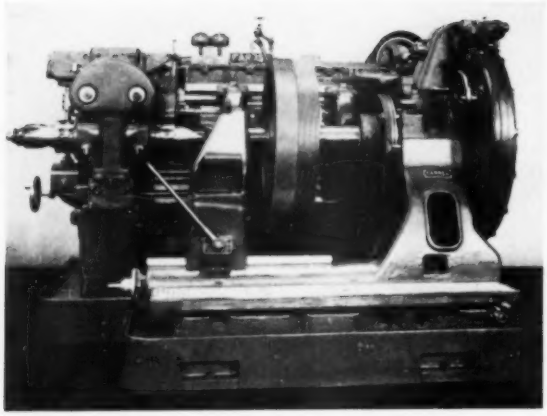
Largest gear shaper ever built, the 10-spindle Fellows machine weighs 42 tons. Each spindle is a separate and independent shaper mounted on a rotating turret adjustable through change gears to give a cutting cycle of from 2 to 20 min. Each station can, if desired, cut a different size and type of gear. On full-automatic cycle machine is controlled from main panel at operator's station. On semi-automatic cycle, turret is started at main control, and individual units as they pass the loading position



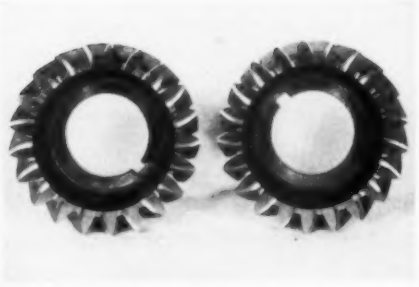
Planetary gear shaper by Fellows. Spindle has been removed to show relative position of cutter and work. The continuous rotary and reciprocating motion of the cutter and work spindles rough and finish cuts one gear for each revolution of the work table. Five pieces are in work at a time, the sixth position, which corresponds with an interrupted section of the cutter, permits loading and unloading while machine runs



Loading cartridges and magazine feed are a feature of the 3-in. fine-pitch Fellows gear shaper. This machine is designed to operate continuously as long as it is supplied with blanks. It is adaptable for either internal or external work and can be operated at speeds as high as 2000 strokes per min

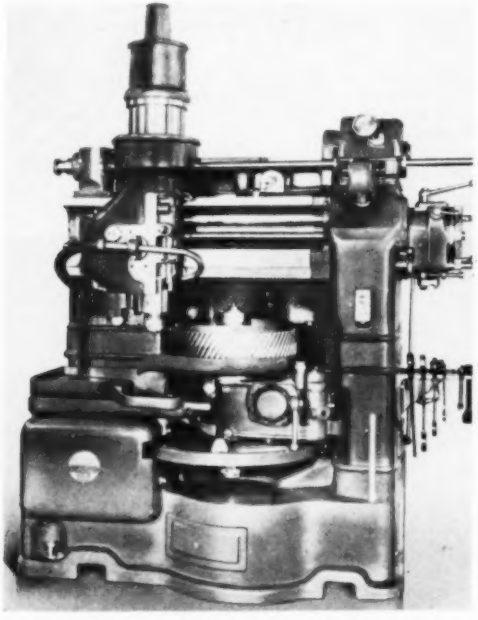


Sykes 5B machine will produce spur, helical, internal and continuous herringbone gears, although its use, in general, is restricted to the latter type. It is available in 5 sizes, from the 1A with a capacity to 12-in. dia and 5-in. face width, to the 5B with a capacity of 1-in. to 61-in. dia and 18-in. face width for continuous herringbone

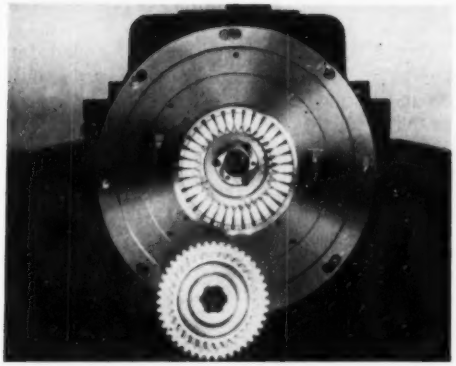


Special cutters used on the Sykes machine for generating continuous herringbone gears. Cutters are mounted on individual heads, independently controlled, and in opposed position in relation to the blank. Each tool cuts on its forward motion while the opposite cutter, on its return stroke, is mechanically relieved by a cam. Helix angle is standardized for 30° and is controlled by guides of proper lead for the inner and outer cutter spindle

Michigan Tool Co's Shear Speed machine produces gears by a forming operation somewhat akin to high-speed broaching, and will cut splines, cams and sprockets with equal facility. Reciprocating motion of the cutter head can be controlled to permit cutting shoulder gears. It is available in 4 sizes with a capacity of 1- to 3-in. dia and 3-in. face for the smallest machine and 7- to 10-in. dia and 3-in. face for the largest



Fellows type 6A generator cutting a helical gear. To control motion in the path of the desired helix, a guide is mounted in the upper portion of the cutter saddle and imparts a twisting motion to the cutter as it reciprocates and rotates in harmony with the work. Indexing and relative rotation of work and cutter are controlled by a worm and worm wheel below the table, and suitable change gears. Table swings out for loading and is locked against positive stop



Cutter head of the Shear Speed machine. Tools are assembled in an accurately slotted head and provided with a rectangular hook at the non-cutting end which fits in a double cone arrangement. At each cutting stroke the tools are fed in by the cone rings and retracted on the return stroke. A cam, actuated by the stroke, provides a heavy feed for the roughing cut and a fine feed for finishing. Tools may be identical for cutting gears or all different for some special shape

not required to cut against a solid section of the blank.

One of the most recent developments in the gear-cutting industry is the Shear Speed machine produced by Michigan Tool Co. The cutter for this machine consists of a series of individual tools arranged radially to produce the spaces between the gear teeth. They are sharpened by removing them from the cutter head and mounting on a surface grinder to maintain uniform height and length of cutting surface on all tools.

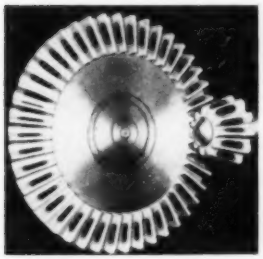
With this machine it is possible to produce almost any external shape that can be produced internally by broaching, such as cams, gears, splines and sprockets, with the further advantage that the reciprocating motion of the cutter head can be controlled to cut shoulder gears. Each of the form tools produces the space of the gear teeth; therefore the cutting tools must conform to the number of spaces around the periphery of the gear to be cut. Four sizes are available with capacity of 1 to 3 in. in dia and 3-in. face width to 7 to 10 in. and 3-in. face.

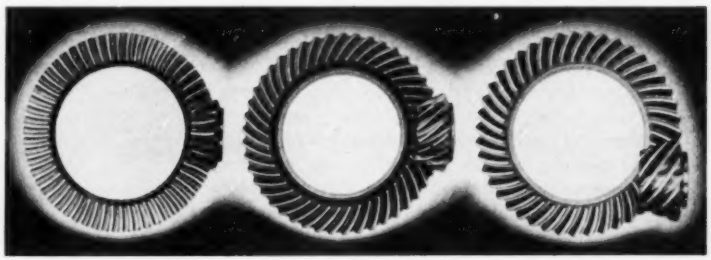
BEVEL GEAR EQUIPMENT

WHEN power is transmitted to parallel shafts, spur or helical gears meet the requirements, but when the power drive turns a corner, gears of another form are necessary. When such shafts intersect, the connecting elements take the form of cones which become bevel gears when teeth are incorporated. The angle between the shafts may vary any desired amount, although 90° is the most common. Gear ratios may also vary within practical limits.

In Zerol gears, the curved teeth of mating pairs are of opposite hands. In general, the pinion is left hand and the gear right hand. They have the same thrust and tooth action as straight bevels and may be used interchangeably in the same mountings.

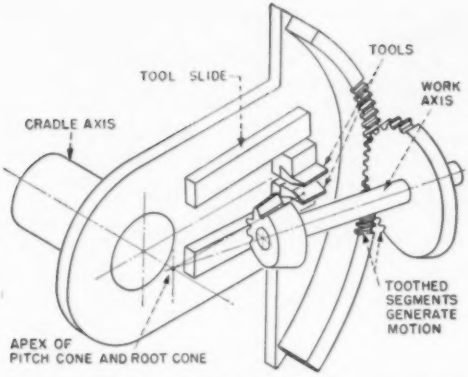
Spiral bevel and hypoid gears, due to the continuous pitch line contact, permit large reduction ratios by using pinions with fewer teeth than is practicable with either straight or Zerol bevels. Provision for thrust must, however, be made for spiral bevels and hypoids.



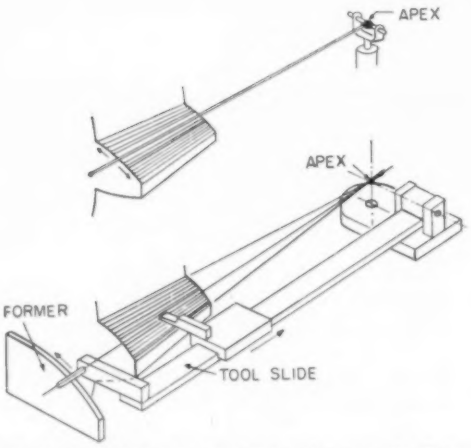


Straight bevel gear is the most commonly used type for angular drives. All teeth elements converge at a common apex. Shaft angles may have any value, and ratios may vary over a wide range. For pitch angles greater than 90° the driven member becomes an internal bevel gear. These are possible within a limited range, restricted by the equipment on which they are produced, and are usually avoided by reversing the position of the driven member

Zerol bevel gears, left, have curved teeth and are actually spiral bevel gears with zero spiral angle. Spiral bevel gears, center, have curved oblique teeth and are used where quietness and smoothness of action are essential, and for high peripheral speeds. Hypoid gears, right, are similar to spiral bevels but with the pinion axis offset above or below the gear axis, permitting the shafts to pass one another. This allows for compact mounting



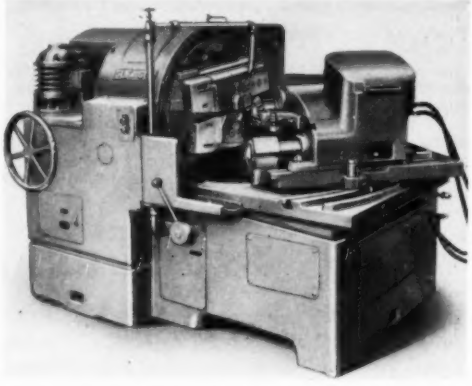
Generating principle of producing bevel gear teeth in which a crown gear and pinion produce the generating motion and two tools reciprocate in the path toward the cone apex



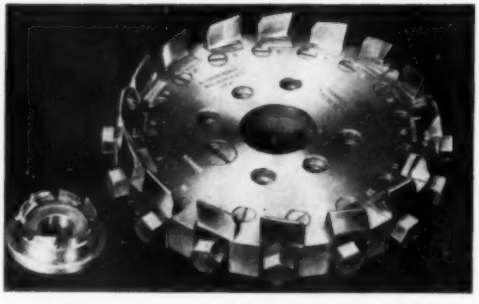
Planing principle of producing bevel gear teeth. Cutting tool reciprocates on a slide which is free to swing about two axes intersecting at the apex of the gear cone

Development of equipment for producing bevel gears paralleled that for other forms of gears quite closely. The earliest forms, other than cast gears, were cut by form milling on a milling machine where the blank was inclined at an angle corresponding to the root angle, and a cutter of correct pitch and range was fed through the stationary blank. Indexing was manual. The same process was followed on the automatic gear-cutting machine except that indexing was automatic. Bevel gears cut with a form-milling cutter are correct at only one point on the face width of the tooth.

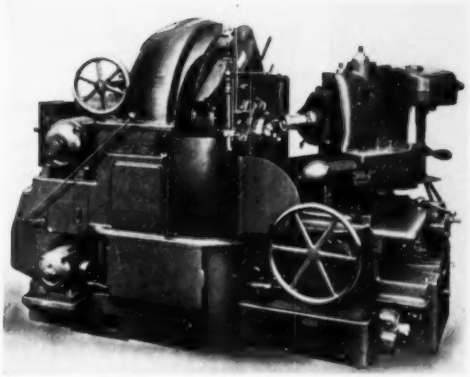
In 1874, William Gleason, who founded the Gleason Works in 1865, invented the first practical machine for cutting the teeth of bevel gears. The principle of this machine, known as the planer type, is still used for very large bevel gears. The cutting tool reciprocates on a slide, and on its cutting stroke travels towards a point corresponding to the apex of the cone, while the slide on which the tool reciprocates is free to swing about two axes intersecting at the apex.



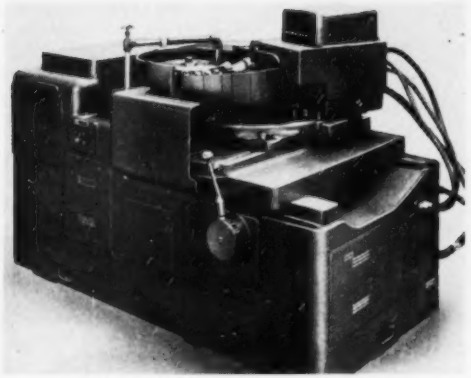
Gleason No. 14 straight bevel gear generator uses the two-tool generating principle. Among the improvements incorporated in this latest model is a mechanism for producing the Coniflex tooth for localized bearing. This tooth form is shown in the illustration of a straight bevel gear and the localized bearing is indicated by the dark areas visible on each tooth. Such teeth are generally more satisfactory than the older uniform tooth form



Spiral bevel gear cutters used in generating machines. The solid type is used for small work but, whenever possible, the inserted blade relieved type should be used with a standard blade holder. Spiral angle is effected by the position of the cutter relative to the gear being cut

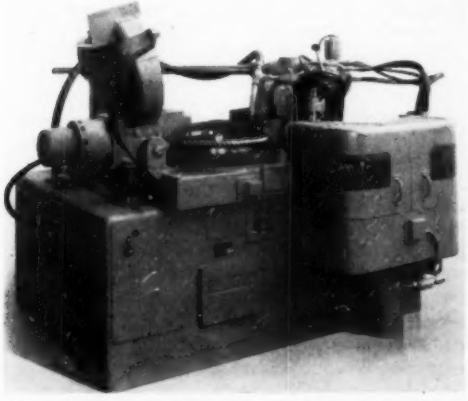


Gleason No. 16 hypoid generator is also suitable for spiral and Zerol bevel gears. For high production of gear ratios greater than 3 to 1, a non-generated type mating gear with a generated pinion is frequently used. Gears cut by the non-generating method are called Formate. Special machines are required for this type, but the mating pinion is produced on standard generating machines



Revex No. 7 straight bevel gear rougher by Gleason rough cuts straight bevel gears rapidly and closely to required tooth taper and profile. Rotating disk type inserted blade cutter of the required pitch and form is mounted on a slide and fed to depth by a cam, then fed horizontally, parallel to the root, across the face of the blank. At completion of the cut, the cutter is withdrawn and the blank is indexed

To guide the tool in its proper path a former or templet is necessary. Generally three operations are required to complete the teeth: the gashing or roughing cut which produces a straight gash representing the tooth space, the finishing cut on one tooth face, and the finishing cut on the opposite tooth face.

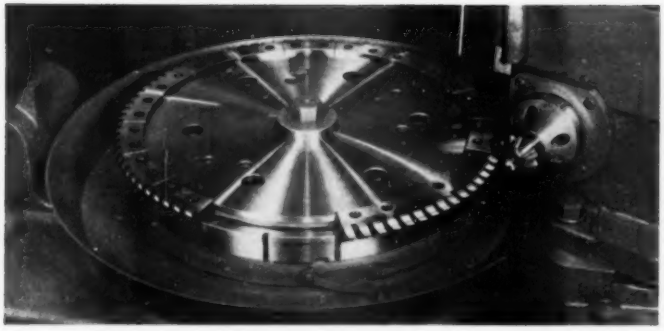


Newest development for completely generating straight bevel gear teeth in one cut from the solid metal is the Gleason No. 8 Revacycle machine. It is intended primarily for high-quantity production, but gears cut on it are not interchangeable with gears generated on standard two-tool generator. Gear blanks must be designed specifically for machining by this process but, in most cases, the same mounting can be used

In 1905 Gleason developed the two-tool generating machine using the generating principle which is the basis of all modern bevel gear generating machines. The mechanical principle is that of a crown gear and pinion rolling together to produce the proper generating motion. The cutting tools on the upper and lower slides reciprocate in the path toward the cone apex. A similar machine for cutting bevel gears, using the same generating principle, was developed by Hugo Bilgram in 1884. This machine, however, employed a single cutting tool.

Spiral bevel and hypoid gear-generating machines use the same generating principle as straight bevel machines with a circular face-milling cutter replacing the reciprocating tools. The relative rotation of the cradle and work spindle produce the required generating motion. During this generation, the cutter, which is mounted on the cradle, represents a tooth of the mating crown gear. The rotation of the cutter about its own axis produces the required cutting action, which takes place on the generating roll. On the return roll the work spindle is retracted to provide the necessary clearance for indexing. Cycle of the generating machine is entirely automatic and comes to a standstill when gear is completed.

In the Revacycle machine there is no depth feed of the cutter, as the desired tooth form is produced by the combined effect of the rotating and translating motion of the cutter and the design of the cutter blades. After each tooth space



Revacycle disk - type inserted-blade cutter turns continuously at a uniform rate. Blank is held stationary while cutter moves in a straight line parallel to the root angle, across the gear face. Roughing, semi-finishing and finishing blades are contained in the one cutter. Gap in the cutter provides time for indexing the gear to the next tooth space after last finishing blade has completed its cut

is partly formed by roughing and semi-finishing blades, the translating motion of the cutter is reversed and during this movement both sides of the tooth space are finished.

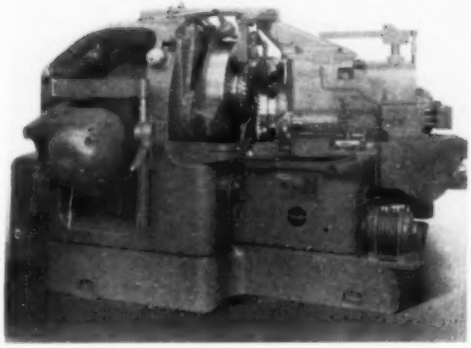
Capacity and range of bevel gear equipment is governed largely by the gear ratio, shaft angle, pitch and cone distance. A general classification would be:

Two-tool generators—Straight bevels	up to 35½-in. dia
Spiral bevel and Hypoid generators	up to 33-in. dia
Revex rougher	up to 14-in. dia
Revacycle	up to 7-in. dia
Spiral bevel and Hypoid roughers	up to 22-in. dia
Spiral bevel and Hypoid planing generator	up to 66-in. dia
Planer—Straight bevel	up to 192-in. dia

Illustrations have been limited to the types of gears and equipment in general use. Other generated forms such as cams, pawls, gear segments, clutch teeth and racks are a few of the possible products of the generating machine.

The constant effort put forth to produce gears of greater accuracy and better finish at increased production rates has broadened the limits of gear design and application. Not too long ago reductions of 3 or 4 to 1 were considered the extreme. Ratios of 8 and 10 to 1 are common today and, for high reduction, Hypoid gears 100 to 1 or more have been used successfully and efficiently. Evidently, the peak has not yet been reached, for the constant attack on these problems by men with training, experience and skill will produce proof of further progress and conceptions of improved applications.

The range of the equipment covered illustrates many makes and designs. Hobbing machines of greater capacity are in use. These are classified as special machines and in some cases have been built by the user for some particular application. Machines to use carbide hobs would come under this heading and are still in the development

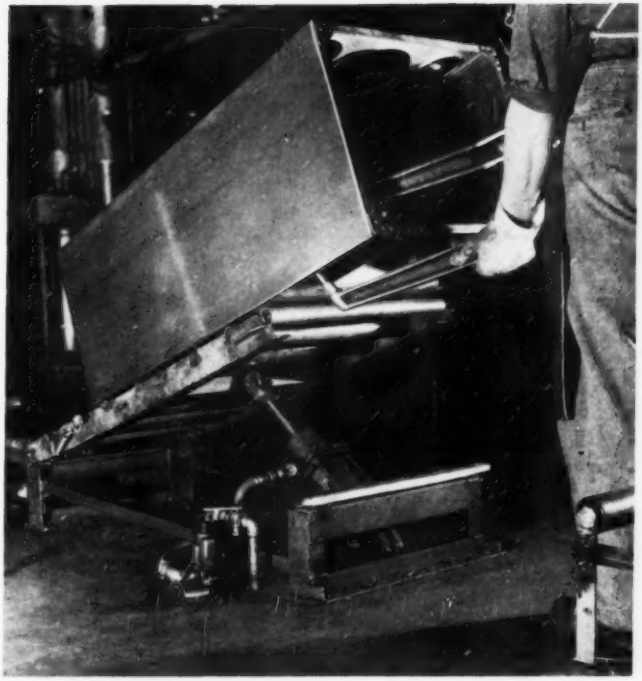


Gleason No. 22 Formate rougher for spiral, Zerol and hypoid gears. Faster speeds and feeds are permitted by the rigid construction and the overhead tie. During the cut, only parts in motion are the rotating cutter spindle and the spindle sleeve for feeding the cutter to depth. No generating motion is employed. After each tooth space is cut, the cutter withdraws to permit indexing to the next tooth space

stage. In production, the functions of the various types of equipment overlap. The choice for a particular gear frequently depends on the machines available or the type which will produce it with the greatest economy. Large gears, wide-face gears, flat gears which can be stacked, and double helical gears are usually produced by the hobbing machines. Worm gears must be cut on the hobber. Spur, helical and double helical can be cut on hobbing or shaper type machines within equal range. Shoulder gears, internal gears and splines, narrow face gears with protruding hubs and flanges are usually produced on the shaper type machines. Continuous herringbone gears can be cut only on the Sykes machine, and bevel gears only on equipment designed for that purpose.

Conveyor Lift Saves Backaches

BY FRED GANDERT, Welding Engineer
Mansfield Works
WESTINGHOUSE ELECTRIC CORP.



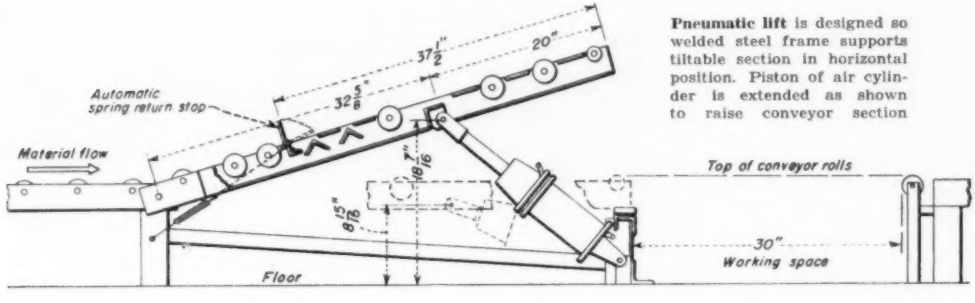
Tiltable conveyor section in refrigerator cabinet assembly line permits operator to weld bottom pan in cabinet without stooping or lifting cabinet. Foot valve controls air cylinder, so operator's hands are free to move gun, which is supported from overhead hanger

WELDING operations on cabinets for Westinghouse domestic refrigerators are performed along a roller conveyor assembly line at the Mansfield Works. Gun welding a pan in the cabinet at one of the stations includes several spotwelds on both sides of the front and rear sections. To ease positioning of the welder, and to eliminate tiresome bending by the operator, an air-operated tilting section has been built into the conveyor.

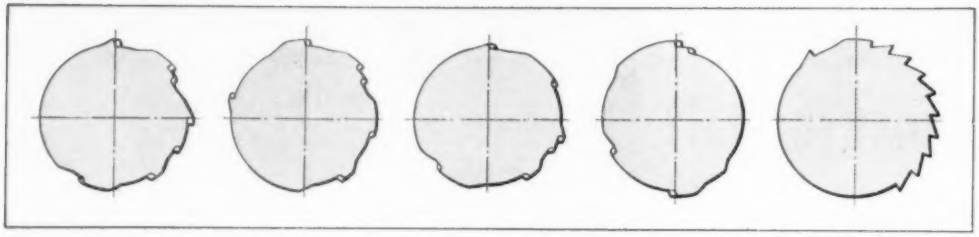
Cabinets roll along a 24-in. wide conveyor into position on the tiltable section. The operator then steps on a foot valve that operates a 4-in. dia, 6-in. stroke air cylinder to raise one end of the conveyor to a working height of 26⅜ in.

A spring-operated stop near the fixed end of the tilting section prevents the cabinet from sliding back on the rollers when raised to the welding position. The stop is hinged to depress when a cabinet moves onto the tiltable section.

Speed-control valves in the air lines from the foot valve to the cylinder control the rate of plunger traverse. When welding operations at this station have been completed, the operator again steps on the foot valve to lower the tilted section and permit moving the cabinet further along the conveyor. The 30-in. working space between the tilting and the next conveyor section permits the operator to move freely across the conveyor line to make the necessary spotwelds.



Pneumatic lift is designed so welded steel frame supports tiltable section in horizontal position. Piston of air cylinder is extended as shown to raise conveyor section



Cam profiles have between 4 and 14 lobes, and a variety of contours are required. Four have helix

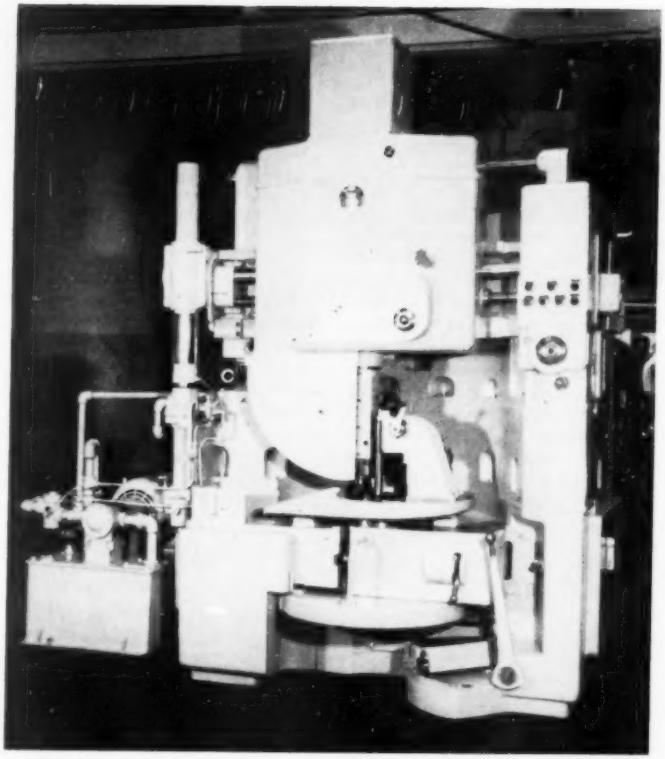
Long Helical Cams Cut on a Gear Shaper

Need and know-how provide the answer when manufacturer and machine-tool builder join forces to solve a problem in production

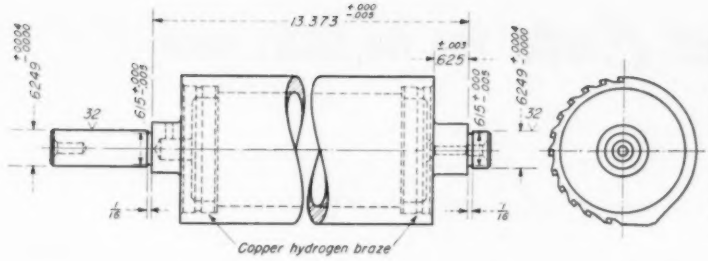
BY WM. M. STOCKER, JR.
Assistant Editor

DESIGNERS at International Business Machines Corporation developed a machine recently that required a series of analyzer cams to control a variety of carefully timed motions. Each cam is assembled from a piece of Shelby steel tubing 2.750 in. OD by 12.130 in. long and two end plugs turned from X-1112 steel bar. End plugs are copper-hydrogen brazed into the tube and plans call for machining both plugs and cam lobes after assembly. Cam rotating support is provided by the end plugs, which are turned, hardened, and ground to plus 0.0004 in., minus zero. Lobes must be machined after assembly to facilitate holding tolerances of 0.002 in. full indicator reading on the concentricity of the lobe radii at any point, with the end supports.

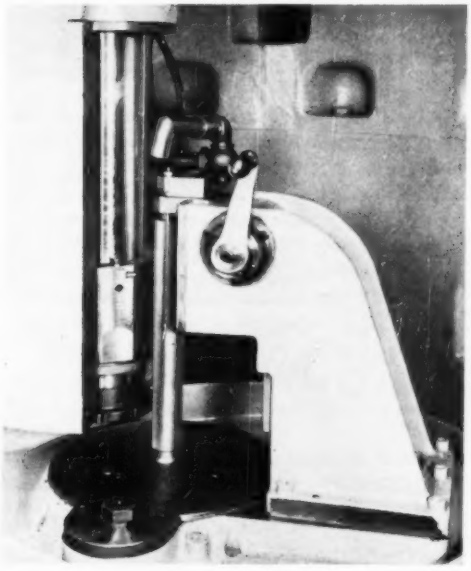
Traditionally, the machining of these cam lobes called for a milling operation. It also suggested exten-

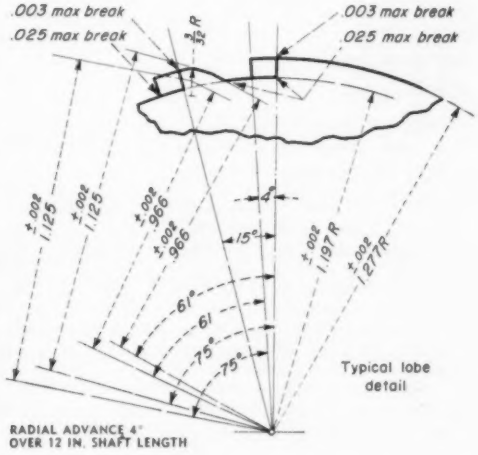


Fellows' 36-in. special gear shaper was modified to produce these cams. However, it is readily converted to similar operations. The ram, hydraulically driven to attain 13 in. of stroke, operates at 28 strokes per minute. Feed is 0.006 in. and two cuts are required, accomplished by incorporation of rough and finish control cams. Both helical and spur guides are provided. Cutting time is 130 min per part



Cam assembly after turning, hardening and grinding to a tolerance of 0.0004 in. on the end plugs. Contours must be carefully controlled as most dimensions carry a tolerance of plus or minus 0.002 in. Four of these cams have helical lobes with a lead of 90.0 ft and a radial advancement of 4° over 12 in. of shaft length

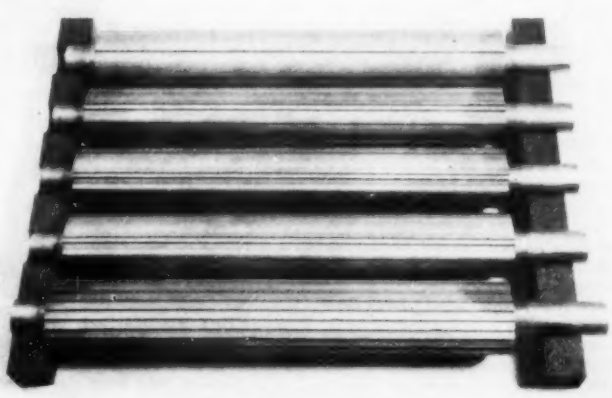




Operation setup is simple and compact. Part is clamped in position by a turn of the crank. Any desired slope or helix may be cut by using a suitable guide which is followed by a shoe on the top of the ram. An 8-in. guide is used to control the 13-in. stroke

sive and expensive tooling and slow production rates—all the usual price for a helical lobe of this length. But why must we always be traditional. If this part were producible on a gear shaper, properly tooled, cutting time would be reduced, loading would be simpler, and accuracy would be retained. The gear shaper would be available for other, similar jobs and special attachments could be kept to a minimum.

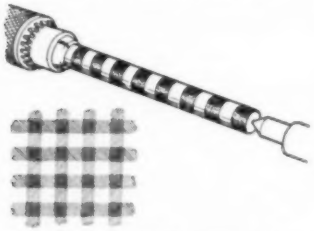
The Fellows Gear Shaper Company was asked by I.B.M. to help solve the problem. The answer was a Fellows 36-in. gear shaper, especially modified to attain the necessary length of stroke.



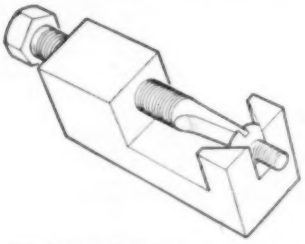
Cam prototypes representing the actual finished parts provide an indication of the quantity and variety of accurately machined lobes produced

Short Cuts FOR THE SMALL SHOP

BY CHARLES L. LEEPER

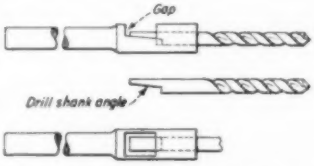


TO "FROST" WORK, proceed thus: First, make a frosting stick out of a piece of hardwood, turning a section about 2 to 5 in. in length to ¼ or ⅜ in. diameter. Scribe every ¼ in., or closer if desired. Glue strips of fine emery cloth the same width as the scribed spaces to alternate spaces on the stick. Now quickly press the work against the stick, letting it touch enough surface to make a row of spots. Each time, press a new surface against the stick to get a series of spots like the black squares in a checkerboard. Then turn the work at right angles and go over the surface again in the same way, rubbing on the portions not previously touched.

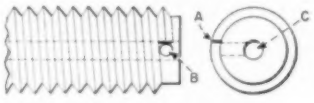


THREADS CLOSE to the head of a machine screw can be cut with a handy holder. To make one, cut a cross slot in a piece of steel about 1x2-in. section, leaving a portion about ¼ in. thick at one end. Now, cut an endwise slot through the narrow section and file out to receive the screw head. Drill and tap a hole for a locking screw with screw-driver bit filed on the end. With the work inserted in the beveled slot, the lock screw is now used to hold it tightly while the threads are cut on the projecting body of the work.

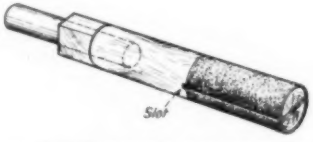
HACKSAW BLADES with broken teeth can be made to last longer by grinding out two or three teeth on a radius. This prevents the teeth adjacent to the broken tooth from striking the work abruptly and also failing.



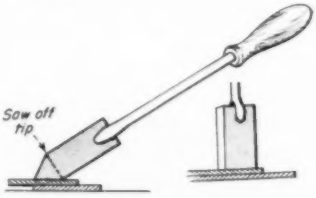
DRILL EXTENSIONS for difficult-to-reach jobs can be made in any length. The end of the drill shank is ground to a tapered flat and this taper mates with a tapered cross-slot in the drill extension, room being left to apply a screwdriver as a drift.



TAPS WITHOUT FLUTES for lead and aluminum cut smooth threads when made as follows: The thread on a screw is cut back to form an undercut cutting edge *A*, and the cross-hole *B* and the central hole *C* are drilled for chip escape. Kerosene makes a good coolant.

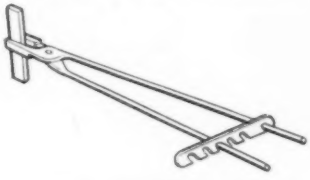


BUSHING HONES that finish the job when a reamer is not at hand can be made this way: Drill one end of a piece of hard wood for a steel drive mandrel of ¼ or ½ in. dia, then turn the wood to size, minus thickness of emery cloth. Slot one end of the tool, insert two pieces of emery cloth and the tool is ready for use.



SQUARE-FACED sweating tools allow more pressure to be applied, and are more comfortably held when soldering parts. To make the tool, saw off the end of an old soldering iron. Now place solder between the parts and apply the very hot iron. The square face insures proper contact of the parts and an even distribution of solder.

UNIVERSAL BUSHING EXTRACTORS are useful accessories. Turn a number of offsets about 1½ in. long on a steel bar about 1½x8 in. To fit particular jobs turn the offsets with the piece between centers.



AUTOMATIC TONG HOLDERS are better than chain links to maintain the grip on pieces of various size. Get a piece of strap iron about 1½ in. wide. Drill a hole in one end to slip over one tong handle. Cut a series of notches along the side of the strap. When the tong handles are squeezed together, one of the notches will engage the second tong handle for a secure grip.

MUDDLING in High Places

It is time for men in Washington and London to stop toying with the problem of international trade. We of the democratic West are at a turning point in our economic affairs. A false step by either the United States or Britain could lead quickly to disintegration of trading between the people of the world as we have known it for the past hundred years. Recent meetings of diplomats in London and Washington have not lifted us out of this danger.

By two simple tests you and I can measure the sincerity of the men in Washington and in London who are trying to solve what they call "the dollar crisis."

One test applies to the British: Is Britain making an honest effort to re-establish itself as a real competitor in world markets?

The other test applies to us in the United States: Are we willing to see Britain re-emerge as a strong competitor in world markets—even in our own home market—and to help her do so?

Today, even though both countries have faced the devaluation test, the answer to these questions probably is no.

I

The situation we face is, in fact, unprecedented. In every important industrial country of the non-Communist world, except Germany and Japan, production is above prewar volume, thanks largely to the Marshall Plan. Yet trade between nations is shackled as it has never been since the 18th century. And the shackles grow day by day. What is worse, two distinct trading areas—the dollar area and the sterling area—have grown up in the non-Communist world, and the gulf between them grows wider.

What kind of leadership have the United States and Britain had in the face of this crisis? President Truman late in August wisely checked the trans-Atlantic bickering over the dollar crisis. *But Mr. Truman showed no awareness of the basic question that the American people must soon decide: Is the United States able and willing to generate trade between nations, as Britain did in the 19th century?*

What have British leaders offered us? Foreign Secretary Bevin and Chancellor Cripps called their September visit to Washington "one of the most important missions in history." *But they did not tell the British people, and perhaps do not admit themselves, that their Labor government must change its internal and external policies if Britain is ever to earn its living in a competitive world.*

Admittedly, the problem Britain has faced since 1945 is a colossal one. But, in the face of its grave difficulties, what has Britain done? The working day was shortened. Welfare economics have run riot. High taxes have sapped incentives. Labor and capital have clung to their prewar psychology of cartels and featherbedding. Government controls and government trading have hamstrung private initiative. Nationalization schemes have injected politics into the struggle for industrial recovery.

Thus the policies of the Labor government have made Britain's adjustment to its new position in the world immensely more difficult. But Americans who attribute the danger of an international breakdown to British socialism greatly oversimplify the problem. Virtually every country in the world, socialist or not, faces the same dollar crisis that Britain faces.

continued on next page

We Americans must recognize that our economic strength unbalances world trade as does Britain's weakness. World War II increased America's superior power to produce goods. It also made the United States more self-sufficient. Thus, while the world demand for American goods has risen, our demand for foreign goods, except for basic raw materials, has not increased. Today we sell more to every major area of the world than we buy from it—and yet we wonder why there is a dollar crisis.

It is time for us to recognize that there are two fundamentally conflicting pressures at work in the United States. One is our desire for a big surplus of exports over imports. The other is our desire for a system of free-wheeling trade around the world. We can not have both unless we as taxpayers wish to subsidize our exports. Which do we want?

Curtis E. Calder, chairman of the International Relations Committee of the National Association of Manufacturers, says, "The battle of the foreign trade gap is essentially that of reconciling our urge to export our surpluses with a reluctance to accept imports in payment for them . . . The dilemma is an uncomfortable one to face."

II

Here, then, are the basic questions that confront men in Washington and London. Does Britain really want expanding world trade or a high-cost welfare state? Does the United States really want expanding world trade or a huge surplus of exports? So far politicians in Washington and especially in London have ducked these issues because they are political dynamite.

If the people of Britain decide they want to regain their position as a competitive trader in expanding world markets, here are specific objectives that men in London should set for themselves:

1. Lower government costs. The British Treasury has asked for cuts of 5% in 1950. But a cut nearer 15% will be necessary, even if that means fewer government subsidies and health services. Enterprise will never revive nor costs come down while taxes take 40% of the British national income, including roughly 60% of business profits.

2. Fewer government controls. Only by removing controls and allocations (except on a few necessities) can Britain begin to return to prices fixed by competition rather than by government fiat.

3. Stronger anti-monopoly legislation for both business and labor. Britain needs a concerted drive against all forms of restrictive, high-cost practices. This drive should put teeth in the anti-monopoly act and supplement it with legislation to end restrictions imposed by trade unions.

4. Less restrictive trading practices. Britain should retreat gradually from its international barter between governments if competition is ever to have free play in international trade.

Meanwhile, if we of the United States sincerely want multilateral world trade, men in Washington must face up to four problems and hammer out workable solutions:

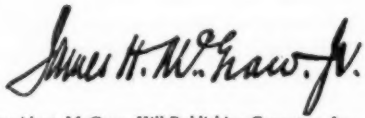
1. Use of the International Monetary Fund to back a devalued pound. In time the Fund, in which we have the controlling voice, might be used to promote convertibility of pounds into dollars.

2. Help for Britain in meeting war-created external debts. This might mean support for London in getting a reduction of the war debts Britain owes India, Pakistan and Egypt, for example. To achieve such a debt reduction for Britain we might have to underwrite a part of a Southeast Asia recovery program.

3. Encouragement of American investments abroad. Such investments should be directed primarily into enterprises which will earn dollars, such as the development of new sources of raw materials, or which will raise productivity abroad.

4. Our own tariff barriers. Our attitude toward this critical issue will be the acid test of how deeply we believe in the merits of free world competition.

If we really want free, competitive trading between the people of the world, these issues must be met and resolved by leaders on both sides of the Atlantic. If we do not want to face these issues, then let us resign ourselves to a world walled off into three trading areas: the Communist bloc, the sterling area, and the dollar area. So far, Washington and London have muddled along, except in facing the devaluation problem. Clarity and courage are still needed.



President, McGraw-Hill Publishing Company, Inc.

ROUND TABLE

Alternate Delegate

"What's eating you, Al? You look like you'd lost your best friend."

"Oh, I've been thinking about Henderson's advancement, Ed. I'm glad they gave him that engineering liaison job. He's a good man and deserves a break. But that's a job that I could have handled, he's younger than I am and hasn't been here as long. I just got to thinking that I may be slipping."

"You're too good where you are, Al. You've been able to do things with the milling machines that nobody could before. Why should they pick you off a job that you're doing well, when they had Henderson on their hands, so to speak, because that Government job ended?"

"It's good management to give a guy a step up, no matter how well he's doing his job."

"There ain't any more money in that job than you're already getting, Al."

"I know the money's no better, Ed. That's not the point. The job is better and has more chance for advancement in it."

"What are you beefing about, Al? Do you want money and a good job, too? There's plenty of chance ahead in your job—who has a better chance at Bellows' job as general foreman of your plant than you do? The Old Man has made it pretty obvious that you're the next man in line."

"That all may be true, Ed, but how long do I have to stay in line? They gave me the milling machines because that department was the bottleneck. I broke it and have kept the department up to snuff ever since. That should put me in line for something soon. Bellows is pretty young yet—it's a long time until he retires. What do I do in the meantime, twiddle my thumbs? I don't like to feel I'm waiting for something to happen to him."

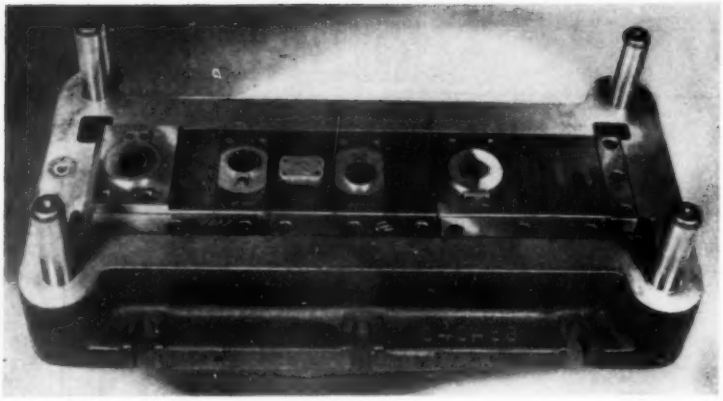
"You're not. It's smart management to have a good man ready for every good job. If they put you on something else, they may not be able to pull you off if they need you in a hurry."

"You make me sound like the indispensable man, Ed, but I feel like the alternate delegate at a convention. Nothing to do or say unless the delegate drops dead. They could replace me now if they had to, and really wanted to—and give me a chance at the next step up."

"Just relax, Al, and stop worrying. If you were slipping, you'd know it. They're saving you for Bellows' job—just in case."

"Well, I'd rather have 'em save me in a better job. Nuts to this getting old and gray while I wait!"

IS IT SOUND MANAGEMENT *to keep a man in a job he's doing well—or to try him in other jobs until the job he's slated for opens up? Is he likely to get so far away from it that he can't handle it when the time comes? Your experience and opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*



Die assembly, showing how interchangeable die bushing holders and spacer blocks are held in master holder by hardened steel side and end wedge blocks. Block between second and third bushings is bumper for embossing punch. Corresponding master punch setup is similarly arranged

STANDARDIZING CUTS DIE COSTS

Studies show three segmental dies, with interchangeable punch and die blocks and spacers fastened in master holders, can form, cut off, and pierce all required sizes of chain side links

BY ERNEST C. NOREEN
Supervisor of Tool Design
Pershing Road Plant, LINK-BELT CO.

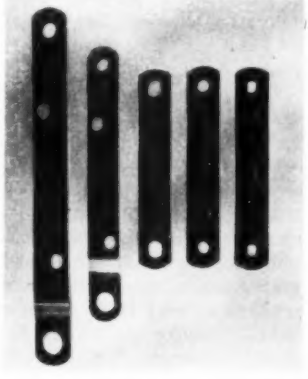
STANDARDIZATION studies of links for side bar chain manufactured at the Pershing Road Plant of the Link-Belt Co., Chicago, have made it possible to develop three standard segmental punch-and-die sets for perforating and blanking all standard links from 6- to 30-in. pitch length in a 500-ton press.

To determine proper tooling, the tool design department examined an entire year's production. This was an extensive survey, as a large variety of chain is made for many applications. Data were segregated according to the widths and types of links. These vary from 5/16 to $\frac{5}{8}$ in. in thickness, from $1\frac{1}{4}$ to 4 in. in width, and from 6 to 30 in. in pitch length. Most links are straight, but a sizeable percentage are offset. The survey also recorded the various radii required on the link ends.

Cataloging the results showed that an extremely flexible die set would be needed to avoid too much downtime for changing tools in the press. Also, the studies showed the possibility of changing the end design of some of the links to make the line more standard. It was discovered that many of the less-frequently used in-between sizes could be eliminated without impairing the strength or serviceability of the chain.

These various problems had to be discussed with the engineering department, because changes were being suggested in design of a product that had been in use in the field for many years. After the engineering department had completed an exhaustive study of how the proposed changes would affect repairs to old installations, the recommendations of the tool design department were accepted with very few changes.

The product survey made it possible to design and produce three novel segmental dies to produce the entire line of links, in place of the many single-product die sets previously employed. Each new die set consists of master cast-steel holders for standard punch and die blocks. Spacers are used between these blocks in assembling the set for any one of the links. The de-



Standard links for side-bar chain are produced in hundreds of different styles and lengths, either straight or offset, and with varying hole sizes and locations. One or two master punch-and-die sets suffice to produce all types, including embossing Link-Belt name and trademark

sign of these three dies also makes it possible to punch links of the same pitch length, but with different-size holes, with very little downtime for tool changeover. As many operations as possible are incorporated in each die setup. Manufacturing cost in some cases has been reduced as much as 25%.

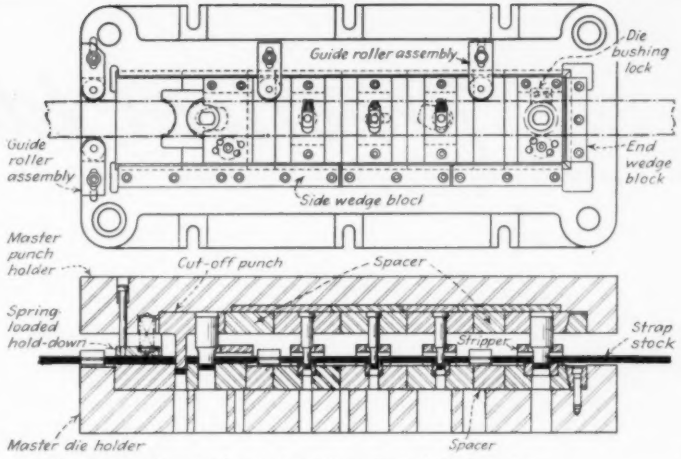
The three standard segmental punch-and-die sets easily can be tooled for the following operations:

(1) Form and cut off offset links of any length, and pierce and cut off straight links up to 18 in. pitch length. These tools are set up in the same pair of master holders.

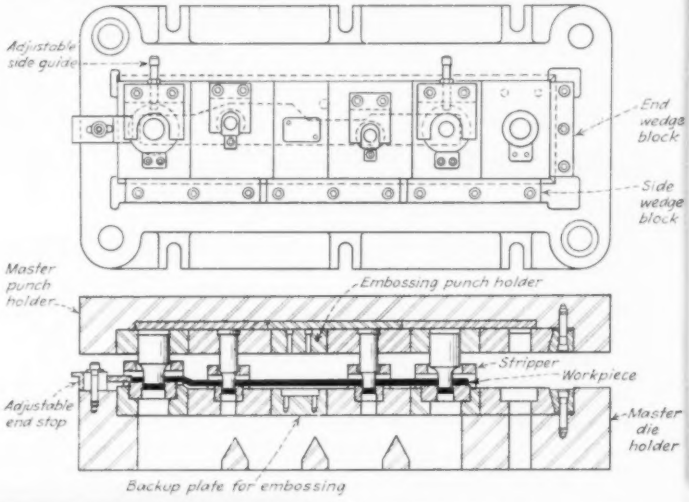
(2) The second pair of master holders can be tooled for piercing and cutting off straight lengths from 18 to 30 in. pitch length.

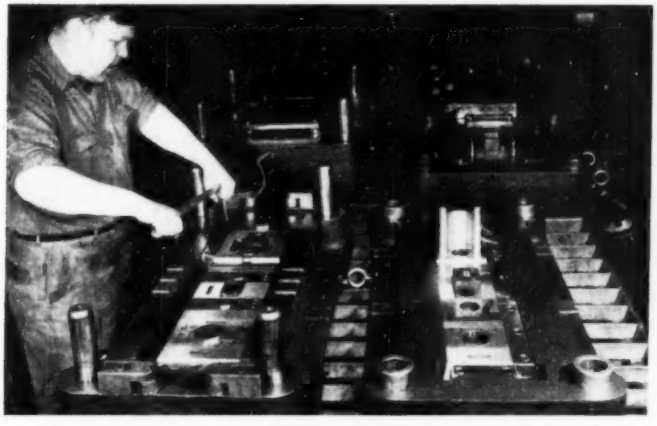
(3) Offset links are pierced and repierced, and all straight links are repierced in the third pair of master holders. Repiercing operations are not always necessary, as a recent development in punch design now permits piercing accurately finished holes in one operation on most links.

Standardization surveys of the type which resulted in the development of the segmental dies shown in the accompanying illustrations can be of considerable benefit in shops making a variety of similar parts on a job-lot basis. Several such surveys now are in progress in the Pershing Road Plant and it already is apparent that these also will result in worthwhile economies.



Typical assembly for piercing and cutting off straight links between 18 and 30 in. pitch length. Strippers are bolted directly to die bushing holders and remain with them at all times. Setup shown is for a 30-in. pitch link with ¾-in. dia attachment holes

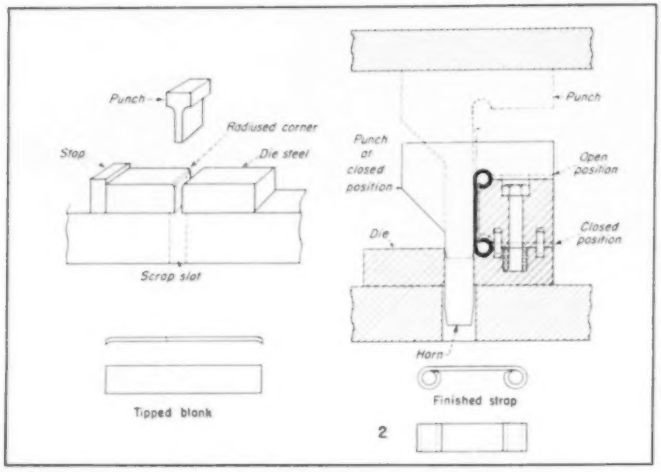




Piercing die for offset links can also be tooled for repiercing straight links. Side guides are adjustable setscrews with hardened points to increase accuracy, as center-to-center distance is held to ±0.001 in. Adjustable end stop is hardened and ground

Diesetter assembles standard components for each standard link by use of an assembly drawing. In die assembly, left, roller guides are installed for strap steel stock. Minster 500-ton, 6-in. stroke press for these dies has feed rack for stock and a scrap elevator

Practical Ideas



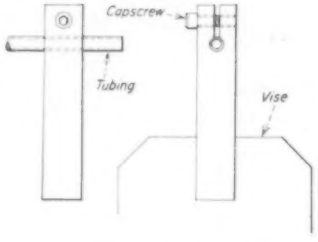
Spanking Punch Forces Double Action in Strap-Forming Die

STRAPS with loops at both ends are turned out in our shop with an unconventional press setup. The loops have to be bent so the ends of each part touch the main body of the part and come into the junction with a constant radius.

The first operation is made on a simple combination pinch and cutoff punch and die. The cutoff punch separates the stock, and, at the same time, pinches the ends to form the start of the radius. Some experimenting was necessary before the radii on the punch and die were correct to form the part just right. Despite heavy stress on the punch, little breakage has been encountered.

The second operation is done in another combination die that is, in effect, double acting. A punch horn guides the punch at all times while the real forming takes place at the side of the punch. Formed radii in the punch and die start the part curving as the punch comes down. Near the bottom of the stroke the punch contacts an auxiliary die section that is spring loaded. This part guides both ends of the part to complete the bending as the die closes.

Parts are fed into the front of the die and fall out the rear after each stroke because the press is inclined. Thickness of the die was determined so the horn would always be inserted in the die. The material is dead-soft, cold-drawn steel, and thickness is either 13 or 16 gage. Separate diesets were required for each stock of material. *B. A. Lee, Lockport, N. Y.*

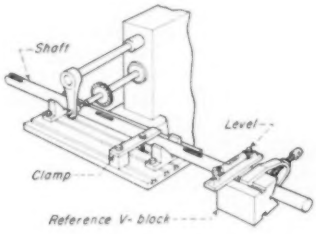


Auxiliary Vise Grips Tubing

TOOLMAKERS who work with thin-walled tubing often have trouble in gripping it securely without flattening it out. A small vise that can be clamped in a regular vise will hold tubing without damaging it at all.

The hole is drilled for the tubing size, and the end of the vise is slotted after the setscrew hole has been drilled and tapped. The whole process only takes a few minutes, so one can be made readily for even a very short job.

A little pressure exerted by the screw will clamp the tubing with pressure all around the jaws of the small vise. *Roger Isetts, Kenosha, Wisconsin.*

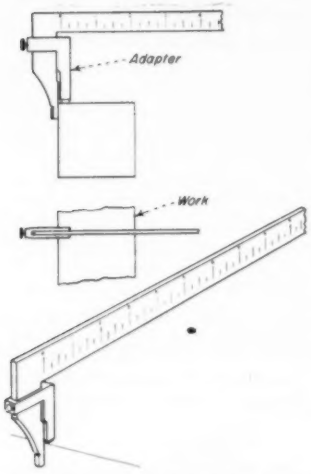


Level Squares Up Shaft for Interrupted Keyway Cuts

WHEN INTERRUPTED keyways must be cut in long shafts, each section of the keyway must be exactly in line with all the others. This isn't tough to handle if the shaft is shorter than the travel length of the milling table, but with a long shaft and short travel, it isn't easy.

A procedure we have tried out and accepted is to combine a vise and a level in the setup. The shaft is first aligned parallel with the table and clamped for the first keyway section. After the cut, a small V-block is clamped to the shaft in some position where it will not interfere with further operations, and a level is attached.

Now the shaft can be unclamped and relocated for other keyway cuts by simply leveling the bubble again when the shaft is in a new position. If the level is fairly good, the reference V-block is clamped tight, and the operator uses some care, the method is foolproof. *R. W. Young, Montclair, N. J.*



Adapter for Vernier Caliper Lifts It Off of Work

CALIPERS that are employed on large work—like boring jobs and planing work, are difficult to hold in place at both ends unless the machinist has a helper. A small block machined to fit the fixed caliper anvil can position the end of the caliper so exact readings can be taken.

The block has an L-shape, with one leg notched to fit in the step in the anvil. The other leg is machined out to fit over the anvil and is equipped with a small thumbscrew to clamp the adapter. Depending upon the kind of work being measured, the adapter can be located right on the step, or can be moved down to lift the caliper high off the work to clear projections.

A second adapter can be clamped to the movable anvil, but it is not really necessary because the mechanic can align that end by eye. *Lowell F. Stull, Youngstown, O*

Non-Tipping Parallel for Dies

DRILLING in heavy die sections can be an unwieldy operation if the work is set up on parallels and must be shifted a number of times for different holes.

This problem can be eliminated by employing a circular parallel. It can be made by taking a stub section of tubing or pipe and grinding off both sides flat and parallel. The die work can be set up on the ring, shifted around, and moved off without much trouble; and the ring is practically untippable. A number of rings of various diameters and thicknesses can be made. *Bernard Levowich, Brookline, Mass.*

Bandsaw Table Attachment Allows Accurate Circular Cutting Work

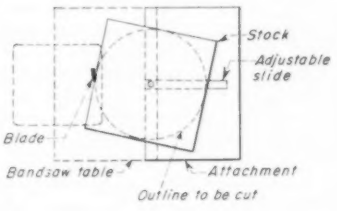
CIRCULAR DISKS or large circular holes can be bandsawed on this extension table that bolts to the edge of the regular saw table. An important feature of the attachment is the adjustable pivot pin that centers a hole drilled in sheet or plate stock for any radius.

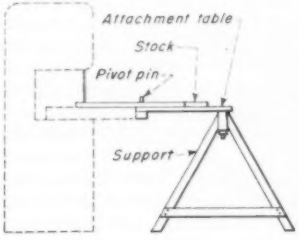
The table is slotted down the middle, with enough stock left at both ends to leave it rigid. A slide that is made up of two plates carries the $\frac{3}{8}$-in. pivot pin in a hole that is drilled for a press fit. The upper plate is drilled in a number of places so the lower plate can be held to it by means of knurled-head screws in different positions. This allows adjustment of the two plates at either end of the slot. Minor adjustments and adjustments along the middle of the slot are made by simply loosening the screws, shifting the slide, and reclamping the screws.

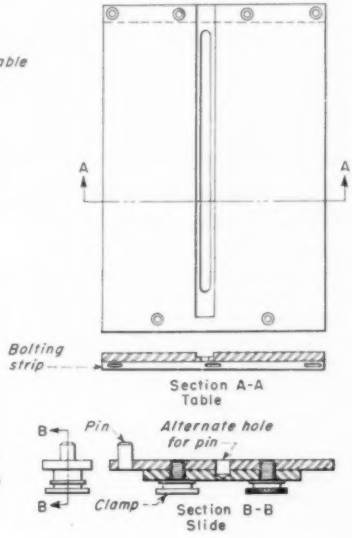
Any kind of support can be added to the outside edge of the table. A strip with three slots under the machine edge of the table allows lateral adjustment in relation to the machine. The table itself is made from 27x18x$\frac{3}{4}$-in. cold-rolled steel.

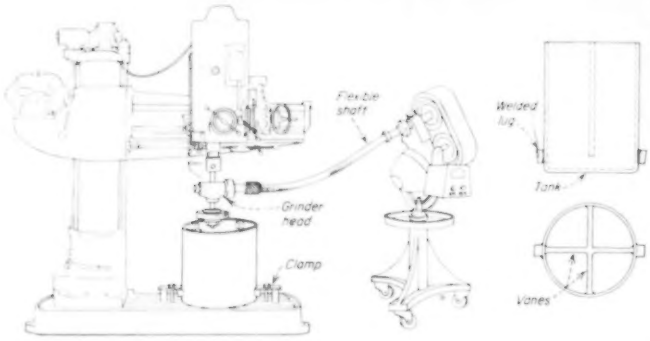
If a center hole is not wanted in the finished work, a plug can be inserted and spotwelded into place. Orders that require a large hole should be treated differently than those requiring a large disk. For the hole, the radial measurement must be made from the center of the pivot pin to the far edge of the blade—for a disk, to the near edge.

Well-finished work can be done with a sawblade that has a fine pitch. Stock can be rotated on the pivot pin easily with hand pressure. For extra-accurate work, it may be desirable to add a collar to fit over the pivot pin to keep the work from riding up, even though this tendency would be slight. *Allan B. Nixon, Springfield, Mass.*





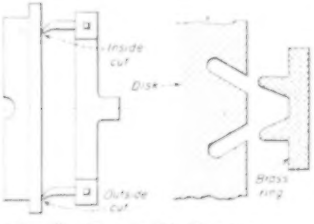




Radial Drill and Portable Grinder Combined to Grind Tank Vanes

FOUR VANES were originally formed into steel tanks we made, but a design change made it necessary to remove them. They were burned out with a torch, but the torch left rough edges and the tanks had to be smooth inside. The rough edges were ground out with a grinder setup on a radial drill. The setup was good for other jobs, too.

First a tank was clamped to the drill table by means of a lug on each side of the tank near the bottom. Then the head of a flexible-shaft portable grinder was held in the drill chuck, and the drill spindle was located over one of the burned ridges. Normal downfeed of the drill moved the grinder wheel down the ridge to shape it closely to the inside surface of the tank. After each ridge was ground off, the drill spindle was repositioned over another ridge and the process was continued. *Allan Clarke, Lancashire, England.*



Circular Dovetails Cut into Valves for Brass Shock Rings

PLUGS for tilting-disk valves must be seated with brass or bronze so valve action will not pound the cast-iron disks to pieces. Although a ring of soft metal can be applied in a number of ways, we dovetail the ring into each cast-iron disk for permanent assembly.

This means that circular dovetail cuts must be made. Two boring bits are mounted on a flycutting holder in a boring machine. The inner slot is angled toward the center of the disk, so the inner bit, mounted on one end of the cutter bar, is pointed in. The outer slot is reversed in direction, so the outer bit is mounted at the other end of the bar, and points in the same direction as the first cutting bit. The inner bit is, of course, closer to the center of the bar.

As the cutter is advanced into the work, which remains stationary, the boring spindle is moved off center so the resultant motion of the bits as they rotate is along their axes. With this motion, both bits cut on their leading edges until full depth is reached, then motion is reversed to extract the bits so they do not gouge.

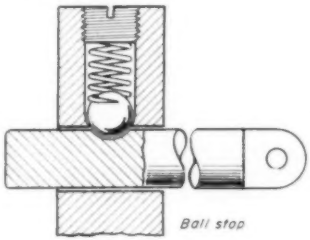
The brass ring is then assembled to each disk. Rings are originally turned to the cross-section illustrated, and expand when they are driven into the disks to fill the dovetail slots. *Chapman Valve Mfg. Co., Indian Orchard, Mass.*

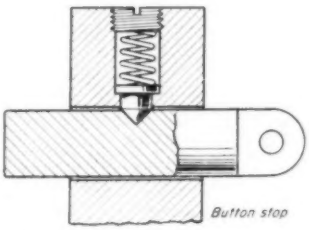
Overload Springs and Balls Reduce Damage to Levers

THESE simple overload mechanisms have been utilized in our plant with great success—and the same ideas can be applied to rotating as well as reciprocating members.

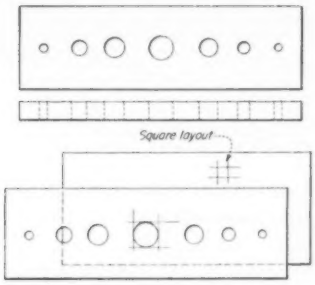
For small sizes, an arm is notched for a ball, backed by a spring and a setscrew, so the ball will transmit normal force to the piston or whatever part it is mounted in. When overloads occur, or if the piston is stopped by an external force, the ball slips out of the notch and allows the lever to move without moving the piston.

Larger members can be controlled with buttons that have conical points which nest in sharp notches in reciprocating members. Setscrews are used to back up the springs because adjustment of the screws varies the spring load and therefore the point in force at which the button or ball will release the moving member. *Ray Cafiero, Brooklyn, N. Y.*





COCK VALVES can best be ground with ground glass, because the glass gets finer and finer, and finally washes out. Emery, on the other hand, will grind into the valve surfaces and unless extreme care is taken will ruin good valves. *J. Martin, Monterrey, Mexico.*

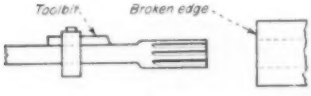


Jig Plate and Box Layout Approach Jig-Boring Accuracy

IF YOU DON'T have a jig borer and you want better accuracy than you can get with ordinary drilling, try this method: Drill a set of holes of common size in a steel plate and harden the plate. The plate should be at least ⅜ in. thick for holes up to a ½-in. diameter.

Make a layout on the work by boxing in the holes—just forget a center mark, and lay out four lines that will be tangent to each hole. Now locate the proper hole in the plate over the layout by adjusting the plate until none of the lines show. Clamp the plate down, and cut the hole with a stub drill.

This method is useful when large parts cannot be moved to a jig borer, too, although accuracy will still not be as good as with a boring machine. *Gerrit Vander Lee, Grand Haven, Mich.*



Toolbit Clamped on Reamer Breaks Burrs on Hole Edges

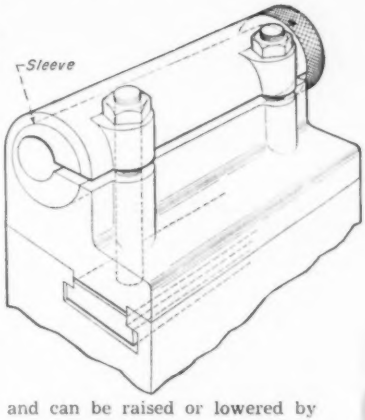
BREAKING the burrs on edges of holes usually requires a separate operation besides the reaming. With this new idea, the use of a separate operation is eliminated.

By clamping a small toolbit on the shank of a reamer the edge of any hole can be broken while the hole is being reamed. The tool can be moved up and down the shank so as to not interfere with the actual reaming. Besides this use, the tool also can be used as a stop for the reamer when reaming blind holes, or when it is desired to keep reamer from going completely through the work. *Charles A. Lauer, General Electric Co., Fort Wayne, Ind.*

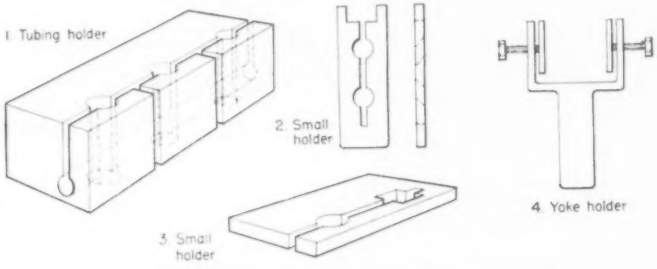
Eccentric Sleeve Adjusts Boring-Bar Height

MY INTEREST was aroused by the boring bar suggested by Mr. Gamelsky in a recent issue. This problem of adjusting boring bars for height is one that hits every shop. My solution is illustrated at the right.

The holder fits on the compound of a 13-in. Willard lathe, and carries an adjustable sleeve with a knurled end. The boring bar is assembled into the collar for a setup,



and can be raised or lowered by simply rotating the collar. Both collar and holder are long enough —4½ in.—to provide plenty of support for the bar. *Daniel Love, Worcester, Mass.*



Four Workholders Simplify Hand Operations on Small Parts

THESE ARE samples of workholders that speed up bench work by holding the work steady and by not being so large that they get in the way.

Tubing and rods can be held in the first holder. Vertical holes for the parts are drilled after the horizontal hole has been drilled, and the block is finally slotted in two directions. Work holes pass to the bottom of the block, but the horizontal hole stops the longitudinal slot. The smaller slots are also through the block, which can be made of brass, steel, or any similar metal with some amount of spring. Work is held in the block by C-clamps over the blocks which press the sides of the holes together.

The second two holders are smaller, but work on the same principle and are intended to be held in a vise. Slots can be cut through holes of any shape. Inclined holes in the second holder fix work at a required angle. Square- and rectangular-section bars can be held in the third block.

The last holder is adjustable for any separation within its range. Fine-pitch screws are employed to position the faces, which can be padded if desirable. Screws should turn in the joint they make with the faces so the faces will not mark the work. *Tyler G. Hicks, New York, N. Y.*

$25 *In addition to regular payment*

for the best

PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

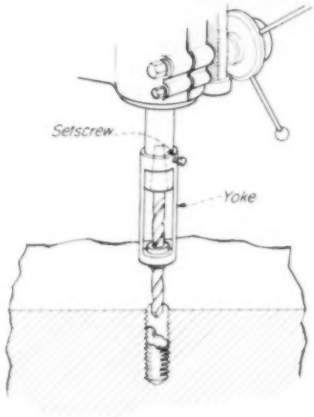
REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

86th Winner:

Ray Cafiero
Balls Measure
Tapered Hole



Yoke Carries Bushing to Support Small Drill

WHEN YOU FIND a drill small enough to cut into a broken-off stud in a tapped hole, it's too weak to do the job, and drills that are strong enough are too large. Here's how you can brace a small drill to keep it from bending and wandering.

The stiffening yoke is welded together and machined to fit on a drillpress spindle—held by a setscrew. The lower arm is bored out to accommodate drill bushings for small-size drills.

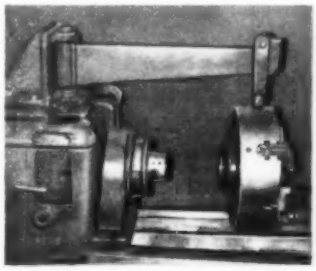
Drilling is started with the yoke clamped so the bushing is well toward the point of the drill, and as the hole progresses, the yoke is adjusted on the spindle to clear the work. The method is especially useful when studs have broken off in soft material like brass, where the drill is quite likely to wander from the stud out into the part unless it is supported. *George F. Burnley, Oakland, Cal.*

Sheet-Metal Box Formed Into Center-Square

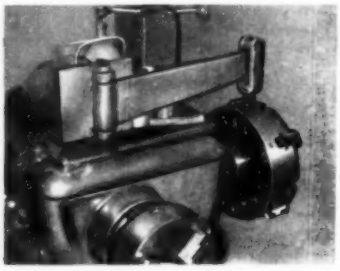
TAKE a piece of sheet steel of convenient gage (18 or 20) and make a shallow box by closing over the edges and soldering the four vertical joints. The box should be perfectly square and even.

Scribe a diagonal on the box and cut out a triangle—some distance from the edges. The diagonal edge

may have to be filed to get it straight. The box can now be employed as a center-square for locating the centers of shaft ends. Simply position the box on the stock with two of the sides near one end of the diagonal touching and scribe along the diagonal, then move the box around a quarter turn and repeat. *Federico Strasser, Santiago de Chile.*



Heavy four-jaw chuck too large for one man to handle is removed from 16-in. lathe spindle nose by one-wheel trolley on overhead beam fixed permanently to lathe headstock. Sturdy hinge allows . . .



Swinging chuck back of headstock, close to wall and out of the way. Smaller three-jaw chuck can then be mounted by operator. Bolt on trolley screws into hole in chuck. *Robert Shaffer, Pasadena, Cal.*

NEWS OF METALWORKING

Steel Strike Won't Hurt Immediate Production, Users Feel

Auto Companies Good For One Month's Output

How much steel do consumers have on hand? AMERICAN MACHINIST has attempted to find out by making an on-the-spot survey through its field editors and correspondents. The facts and figures resulting from this survey are set forth in this article.

NEW YORK—The steel strike finds the country's big users not overly worried about inventories as they affect immediate production, but most are wary of the bottleneck that can result if they run out of small items needed before products can be fully assembled and shipped to the customers. In general, the feeling is that the strike won't last too long.

Consensus of auto companies on steel is that they will be able to run through the month without stoppage, despite the strike. Thus, General Motors figures three to four weeks from the strike's start. Ford says 30 days, maybe 45. Nash expects to be able to finish October. Chrysler has no firm date, saying it depends on suppliers. Packard has already reduced schedules to three days a week. Studebaker has steel for "several weeks," according to A. O. Peterson, vice president in charge of manufacturing.

In the Cleveland area, no apprehension is being felt by the biggest steel users, although some are wondering about steel supplies in hands of their customers which might cause them to close.

Chicago Firms Report

Here's the picture around Chicago:

International Harvester estimates that it can operate about three weeks with present steel inventory at present production rate.

General Motors' Electro-Motive division can hold out for five to six weeks.

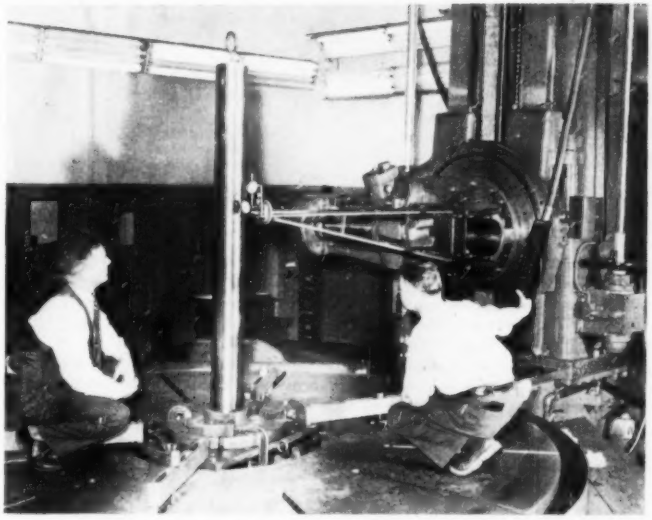
Verson Allsteel Press Co. has steel in stock for about ten weeks' operation at present rate, having stocked up heavily when the strike first threatened.

Oliver Corp. advises that some plants have only two to three weeks' supply on hand, though others are in better shape. President Alva W. Phelps says that in the interest of providing as much work as possible for Oliver employees during the strike, the company will continue all possible operations as long as the financial condition of the company permits. Parts made will be stockpiled until the items in short supply because of the steel shortage then can be made.

Pullman-Standard Car Mfg. Co. is reported to have enough coal and steel to run for about two months.

And elsewhere, one maker of washing machine tubs has a month's supply of tubs on hand, and enough raw material for another month's work.

A large appliance manufacturer is balancing its present stock to operate as long as possible. The company is not sure how long its steel stock will last, but it looks as if all lines can be kept in production for several weeks.

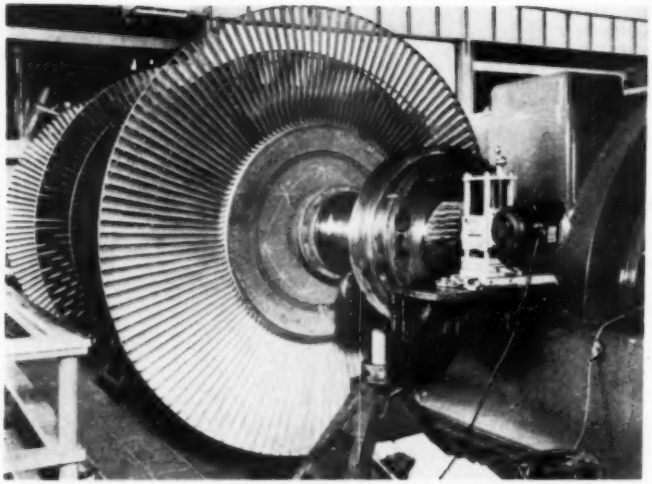


A 160-IN. GEAR HOBBER at the Sunnyvale, Calif., plant of Westinghouse Electric Corp. is shown here undergoing a test to make certain that the machine's stanchions are square to the table. The testing shaft or "pig" is set perpendicular to the table with zero tolerance. Two dials extending from the hob slide of one of the machine's stanchions test the perpendicularity of the stanchion in two planes. To pass its test, the stanchion must be parallel to the "pig" within 0.0002-in. on both dials for the entire length of the testing shaft. Time required for the test is 40-48 hr.

93 Equipment Items In N.Y.C. Contract

NEW YORK — Harrington - Wilson Brown Co.'s low bid of $323,333 won for the firm a City of New York Board of Transportation contract for machine tools and equipment involving 93 different items. The contract is for furnishing, delivery and installing equipment for the new East New York bus depot at Fanchon Place and Jamaica Ave., Borough of Brooklyn.

Major equipment to go into the shop includes radial drills, grinders, arc welding machines, drills, brake drum lathes, tray top lathes, miscellaneous other lathes, press brakes, bending rolls, metal cutting saws, hydraulic presses, honing machines, a lapping machine, a miller, a shaper, and a nibbling machine.



***ON-THE-SPOT MACHINING** of this turbine by the Versa-Mil shown saved over twice the machine's cost in its first two days of use. Repairs on the turbine at a power generating station required removing ¼-in. length from the rabbit of a coupling. The piece was too heavy and large to be machined in a local shop; to return it to the manufacturer, at an estimated cost of $2000, would have required shutting down the turbine for two weeks. Instead, machining was done in the power station by bolting an angle bracket to the coupling face, on which was mounted the Versa-Mil with its feed table. The end mill removed the full ¼-in. depth of cut in one pass, but since the feed table and vertical lead screw provided travel limited to 9x7-in., four settings were made to complete the job. The Versa-Mil is made by Versa-Mil Co., New York*

Cost Cutting Methods Told at Fall Meeting of ASME at Erie

ERIE, PA.—Production executives gathered here for the fall meeting of the American Society of Mechanical Engineers were given a preview of things to come when C. A. Rystogi, superintendent of refrigerator unit manufacturing, General Electric Co., Erie, described a semi-automatic set-up for the assembly of precision components for refrigerator compressors. Near-complete mechanization of the muffle-box assembly sequence will permit three operators to produce as much as eleven workers now turn out with conventional equipment.

Presently a straight-line setup occupying 350 sq ft of floor area, the new arrangement groups machines around a 6-ft diameter circle and requires a total of only 84 sq ft of floor space. Automatic part feeding is employed wherever possible and interlocking controls synchronize the operation sequence. Assembly progresses on a 5-second cycle with the longest operation determining the cycle. At the test station, any defects automatically are segregated into three groups depending upon the fault.

Although savings are expected to run in the neighborhood of $25,000 and fewer operators are required, no speed-up is involved; the new setup is simply an extension of automaticity to a field in which manual labor has predominated until now. This field, in the opinion of the conference, is one that offers great opportunity for cost reduction and one in which considerable future development is expected.

Focusing on another phase of operations in which large savings can be obtained, Carl E. Blass, manager of planning, Talon, Inc., Meadville, Pa., described a company-wide program for the mechanization of materials handling operations. In six months, this program has amortized a $40,000 investment. Largely responsible for the improvement is the broad application of pallets and special work carriers in conjunction with motor-driven fork-lift trucks.

Importance of Scrap Told

The importance of scrap and salvage operations to the metalworking industry was emphasized by Floyd E. Bliven, supervisor of salvage, General Electric Co., Erie. "It is not uncommon," Mr. Bliven said, "that every fifth car leaving the plant is loaded with scrap." Proper methods of handling must not be overlooked and at General Electric a broad variety of containers and vehicles have been applied. Scrap handling is done on an incentive payment plan and operations currently show a 15.5% increase in efficiency over war years.

Scrap Eliminates Ores

The speaker pointed out, too, that scrap eliminates 50% of the ores, limestone, ferro-alloys, and hot metals in making steel. As 68 tons of raw material, steel in process, by-products, and waste products are estimated to be handled for every ton of finished steel, the proper preparation of scrap can save 34 tons of burden on the railroads for every ton of finished steel, Mr. Bliven noted.

Turning to the human side of production, a panel led by A. C. Harper, president of Wyomissing Polytechnic Institute, and made up of training directors, R. Ellis of General Electric, and D. Pratt of Cincinnati Milling Machine Co., stressed the need for interest on the part of top management. Close contact between company executives and trainees is essential to develop young men who have the proper attitudes and esprit de corps and who will form a reservoir of skilled men for promotion and advancement into high positions in the organization, all speakers agreed.

Tool, Die Makers To Convene in N.Y.

NEW YORK—Business problems of tool and die manufacturers will be the subject of a panel discussion at the Monday, Oct. 31, session of the National Tool & Die Manufacturers Assn. convention, to be held at the Hotel Statler Oct. 30-Nov. 2.

L. R. Boulware, vice president in charge of employee relations for the General Electric Co., will deliver the Tuesday luncheon address, entitled "Management On the March." A Tuesday afternoon panel will discuss "Employer-Employee Relations."

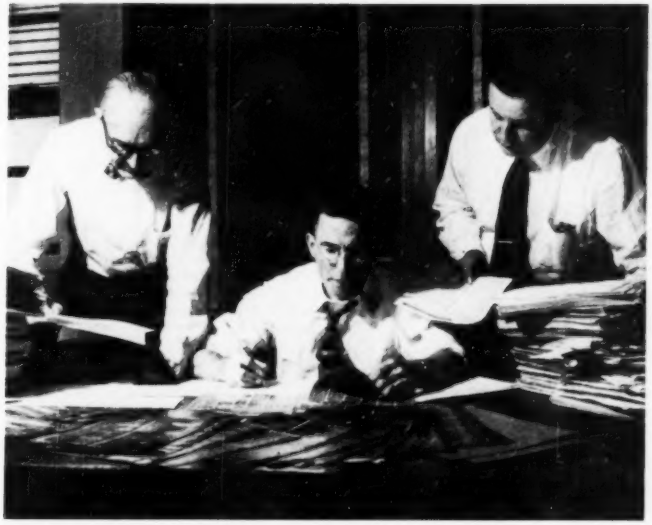
To Talk on Socialization

Dexter Keezer, economist for the McGraw-Hill Publishing Co., New York, will speak at the Tuesday afternoon session on, "How Serious Is This Threat of Socialization?"

The convention opens on Sunday, Oct. 30, with afternoon meetings of the committees on business management, finance, planning and public relations, followed by an evening dinner for early convention arrivals.

Other committee meetings scheduled: fact-finding, government relations, industrial relations, membership and technical on Tuesday morning, and mobilization planning on Wednesday.

Thousands of Plants Give Detailed Reports on Equipment



THE MID-CENTURY INVENTORY OF METALWORKING EQUIPMENT gets a final checking over by Associate Editor Anderson Ashburn, as Art Director Sidney Oxberry (left) and Managing Editor E. J. Tangerman look on. Under Mr. Ashburn's direction, a staff of statisticians has been tabulating, analyzing and summarizing the returns for several months. Work on the Inventory actually started back in February

Next Issue Will Present Mid-Century Inventory

NEW YORK—The Mid-Century Inventory of Metalworking Equipment—the most complete and detailed report on the size and condition of America's Metalworking plant—is nearing completion. It will be published in the next issue of AMERICAN MACHINIST.

Since the preliminary work began last February, more than 50,000 questionnaires have been mailed to industrial plants of all sizes, with thousands of detailed returns received and tabulated. The entire editorial staff of AMERICAN MACHINIST has contributed to the project at different times, as well as many special departments of McGraw-Hill, incuding research, economics, statistical, illustration, circulation, mailing, transcribing, graphic arts, and varityping.

156 Types of Equipment

The Mid-Century Inventory is the latest in the series published at five-year intervals beginning in 1925. It will give detailed data on 156 types of equipment, showing how many units of each type are in place in the metalworking industry, and how these units are distributed geographically and by industrial divisions. It will show how much of the equipment is 10 to 20 years old and how much is over 20 years old.

College Shop Equipment

Special studies will show the types and ages of equipment in maintenance shops outside the metalworking industry, and in college shops.

The November 3 issue of AMERICAN MACHINIST, which will contain the Mid-Century Inventory of Metalworking Equipment, will be priced at $2.00 a copy.

Industrial Relations Will Be Theme Of 50th Metal Trades Convention

CHICAGO—The 50th annual convention of the National Metal Trades Assn. will be held here at the Palmer House Oct. 26-28. More than 1000 industrialists from all sections of the country will attend. The golden anniversary theme will be "Forging Ahead with 50 Years Experience in Industrial Relations."

NMTA's viewpoint on the importance of employee communications is reflected in the plans for a full-day workshop on the topic, "In-Plant Communications and How to Get It in Your Plant," Oct. 26.

Among major subjects to be covered are: the international scene, the current economic situation, averting socialism by positive action, measuring the effectiveness of industrial relations programs, cost reduction, work simplification.

T. J. Morton, NMTA president and head of the Hoosier Cardinal Corp., Evansville, Ind., will preside over the sessions. Election of new officers will be held Oct. 28.

Among the prominent speakers to appear are: Brig. Gen. Frank L. Howley, recently retired American commandant in Berlin; W. F. Rockwell, chairman of the board of the Standard Steel Spring Co., Coraoplis, Pa.; Roe Clark, vice president of the Package Machinery Co., Springfield, Mass.; H. M. Ramel, vice president of the Ramsey Corp., St. Louis, Mo., and H. Thomas Hallowell, vice president and general manager of the Standard Pressed Steel Co.

No Tool Engineer Should Miss Montreal Meeting, ASTE Says

MONTREAL—No tool engineer can afford to miss the technical programs planned for the Oct. 27-29 semi-annual meeting here of the American Society of Tool Engineers, Harry E. Conrad, executive secretary, has declared in a bulletin to members.

Here's a summary of the program, to be held in the Mount Royal Hotel:

Thursday, Oct. 27—mold dies, 2:00 PM; cost cutting, with tools, 2:00 PM; surface measurement, 8:00 PM.

Friday, Oct. 28—cost cutting, tools and dies, 10:00 AM; cost cutting, with machines, 10:00 AM; cost cutting, estimating and economics, 2:30 PM; cost cutting, in limited production, 2:30 PM; hot machining, 8:00 PM.

Saturday, Oct. 29—quality control, 10:00 AM; semi-annual dinner, 7:00 PM.

Tours through these Canadian plants are scheduled for Thursday: Turcot Works, Canadian Car & Foundry Co., Ltd.; Canadian Vickers, Ltd.; Dominion Engineering Works, Ltd.; Telephone division of Northern Electric Co., Ltd.; Wire & Cable Division, Northern Electric Co., Ltd. And on Friday, these plants: RCA Victor, Ltd.; Canadair, Ltd.; Canadian Pacific Railway Co.'s Angus shops, and Montreal Locomotive Works, Ltd.

Big Job Faces Tool Stockpilers; Some Stored Items in Poor Shape

WASHINGTON — Government tool stockpilers are just starting to catch up with the mistakes made during the huge tool acquisition program of the past four years.

The job of final processing of the hundred-thousand-odd tools for the next war is just getting started. Tool experts charged with the job are finding that they have the processing to do all over again because of a lack of uniformity in packaging when the tools were first declared surplus.

When wartime factories closed their doors, cut the power, and started crating tools, there was little adherence to storage specifications.

Unprotected on Inside

It has been found that some tools, coated adequately on the outside with preservative, are completely unprotected on the inside. When cleaned off and stripped, many tools are found to be rusted and damaged because of earlier slipshod processing.

Both categories of stockpiled tools, those in the National Industrial Equipment Reserve, managed by the General Services Administration, and those in the larger and more select reserves maintained by the individual military services, are just beginning to get final storage attention.

The NIER's two storage centers at Buffalo, N.Y. and Gary, Ind. have established processing lines. Here equipment is disassembled, inspected, cleaned, renovated when necessary and where possible, and finally preserved for a 10- to 20-year period. Once the tools are finished and stored, they will still be subject to annual inspection.

If the tool is warped or damaged, the storage people try to fix it. Some cannibalism is carried on when possible. Large component parts are not usually replaced, but bushings and bearings are. If a tool needs major repair work, it is set aside until Munitions Board committees can check it and rule on whether it should be junked or repaired.

Army Ordnance has led the field in developing dismantling, cleaning and processing techniques. New methods have been worked out where tools can be cleaned for inspection in a matter of a few minutes, where once it took hours.

The Navy also has established processing lines at its storage center and is dismantling all equipment to facilitate complete cleaning, reconditioning, and preserving. Here Navy men have adapted the new cleaning methods also.

The Air Force is the only service which is not entering into a big preservation program. Rather than completely preserve tools for long-term storage, the Air Force has decided to clean the tools and maintain them in dry storage with little preservative on them. They are dewatered and dried, and sulfonated oils are drained from crankcases and sumps. Nor are these tools given many repairs. The policy here is that contractors who are given the tools to use will be responsible for fixing them up. While the tools are in dry storage they will be maintained on a contractual basis by civilian companies, who will obtain the contracts by competitive bidding.

The cost of fixing up tools, so far, has remained relatively small. Cannibalization has helped keep this down, but this technique is only good where there are many like items being processed and where repair is an exception rather than the rule.

Executives in charge of the NIER processing centers are depending upon the reserve review committee of the Munitions Board to make periodic reviews and constructive suggestions on the storage job. The committee, composed of qualified civilian industrialists and tool experts, will make an inspection of the centers late this fall, probably in November.

CALENDAR OF EVENTS

OCTOBER 24-26—American Gear Manufacturers Assn., annual meeting; Edgewater Beach Hotel, Chicago.

26-28—National Metal Trades Assn., annual convention; Palmer House, Chicago.

27-29—American Society of Tool Engineers, semi-annual meeting; Mt. Royal Hotel, Montreal.

30-Nov. 2—National Tool & Die Manufacturers Assn., annual meeting; Hotel Statler, New York.

31-Nov. 2 — Packaging Machinery Manufacturers Institute, 17th annual meeting; Edgewater Beach Hotel, Chicago.

NOVEMBER 2-4—American Society of Body Engineers, 4th annual technical convention; Rackham Memorial Bldg., Detroit.

2-4—Industrial Management Society, 13th annual time and motion study clinic; Sheraton Hotel, Chicago.

3-4—Society for Advancement of Management, annual conference; Hotel Statler, New York.

10-11—American Society for Quality Control, 4th midwest quality control conference; Jefferson Hotel, St. Louis.

14-17—National Electrical Manufacturers Assn., annual meeting; Haddon Hall, Atlantic City, N. J.

CASTING POT FOR ALUMINUM *that eliminates gas bubbles due to slag and impurities in the metal is being used successfully by Murphy Knife Co., Portland, Ore. Aluminum passes through siphon from one compartment to another, leaving behind impurities and slag which cause bubbles. When the aluminum is melted in one compartment of the crucible, heavy impurities sink to the bottom, while lighter ones float to the top, leaving pure metal in the center. Gravity siphon moves the pure metal to the second compartment, from which it is dipped and poured into the casting mold*

Role of Assembly Line Operations Stressed in Plane Output Forum

LOS ANGELES—Means and methods of increasing production of planes and engines in event of war were studied by engineers assembled here Oct. 6-8 for the SAE National Aeronautic Meeting.

Development of assembly line operations was urged by R. P. Kroom and F. D. Bergvall of the aviation gas turbine division, Westinghouse Electric Corp., South Philadelphia. They reported that aircraft engine production can be expedited and streamlined by arranging the parts to comprise sub-assemblies separately to be fabricated by those skilled in such operations. They explained that the turbojet engine is particularly well adapted to the sub-assembly plan, each unit being assembled and tested, and adjustments made or errors corrected, without affecting the ultimate finished product.

Extension of the sub-assembly plan to the subcontracting stage was described by K. N. Bush, of General Electric Co., Lynn, Mass., who said that 200 subcontractors and suppliers, located throughout the United States, now contribute to the manufacture of a General Electric gas turbine designed for use in war planes. About 40 subcontractors provide the 15 major components of the engine, he said, while 50 others supply the 40 with basic parts, 50 more supply accessory items, and another 60 supply fittings, bolts, and nuts.

20,000 Jet Engines Per Month

In a technical paper prepared for presentation by A. T. Colwell, K. M. Bartlett, and R. E. Cummings, all of Thompson Products, Inc., Cleveland, it was estimated that, in case of war, more than 20,000 aircraft gas turbine engines would be required monthly. This monthly output was said to require something on the order of 25,000,000 compressor rotor blades and stator vanes per month, about 2,000,000 turbine blades, and around 1,500,000 nozzle vanes.

Close Tolerances

They explained that the difficulty of producing parts for turbine engines, because of close tolerances and hard-working materials, is a handicap to producibility which must be considered in the design stage. They said production is expedited through use of the "lost-wax" investment casting process for making blades and vanes, adding that the new Mercast process appears to be of additional help by assuring precision casting through the employment of mercury patterns at moderately low temperatures, and by curtailing scrap losses.

The Oct. 7 morning discussional session, based upon requirements of structural design and fabrication of airplane parts, revealed that this country has a shortage of extrusion presses of adequate capacity. The German aircraft industry, preparing for World War II, early turned to large forge presses, it was explained by Maj. Gen. K. B. Wolfe, deputy chief of staff for materiel, Air Materiel Command, Wright Field, Dayton, Ohio. General Wolfe said that presses of 4000 to 5500 tons capacity were the largest available in the United States, although the German aircraft industry had a 30,000-ton press, three 15,000-ton presses, and numerous smaller units. The American government, he added, now has financed the construction of an 18,000-ton press, and large units have been brought here from Germany so that larger aircraft forging now may be made.

New Design Philosophy

Tapered sheet and large pressure forgings have been made necessary not only by the jet engine but by a new design philosophy applied to aircraft wings in which ribs are replaced by webs covered with bending material, according to S. J. Pipitone, of Glenn L. Martin Co., Baltimore. He explained that the spanwise internal structure provides greater enclosed space for controls, lines, and ducts, producibility is enhanced because of the greater ease of assembly, and there are substantial savings in weight and in cost. He recommended the use of machine tapered sheet for wing coverings, commenting that the machining process is economical even now and will be even more economical with further developments in technique and equipment.

Users of Zinc Die Castings Assured of Alloy Quality

NEW YORK—A certified zinc alloy plan by which die casters may identify castings with a certification seal has been announced by the American Die Casting Institute. The seal becomes a mark of metallurgical quality helpful in protecting die-casting purchasers.

Definite composition limits for zinc die-casting alloys have long been established by the American Society for Testing Materials, the Institute said, and the new plan is designed to insure that every zinc die-casting bearing the certification seal will retain metal specifications conforming with these limits. This is accomplished under a plan for frequent sampling of castings by all participating die-casting producers for analysis by an approved laboratory.

Film on Malleable Iron Available to Firms, Colleges

NEW YORK—Premier showing of a 40-min. Technicolor-sound film, "This Moving World," depicts the dependence of industry, transportation and the public on the shock-resisting properties of malleable iron. The sponsors—Malleable Iron Founders' Society, Union Commerce Bldg., or any one of the 76 member firms will loan the film in 35 mm. or 16 mm. sizes to industrial firms and colleges.

Of particular interest to the shop man are machining scenes, showing the ease with which the material is cut and the fact that finish-machining operations are often not necessary, and that the tools need regrinding only after several shifts' use.

WEDGE-SHAPED PLUNGER *plus small cup make up new device which is inserted, in valve assembly repairs, beneath valve stem to catch keeper keys so they can easily be removed from valve assembly without falling down into motor. Tool was devised and will be manufactured by O. H. Lunda, 685 Thompson St., Salem, Oregon*

Detroit

AUTO PRODUCTION OUTLOOK RESTS WITH STEEL SITUATION

UNION TO SEEK BLANKET PENSION PLAN FOR TOLEDO PLANTS

Pittsburgh holds the key to the production outlook of the automobile industry for the period ahead.

These two alternate prospects are at hand: (1) If the steel strike is settled by the time these words are read, in the latter part of October, then ouput will hardly have been ruffled. (2) If the steel strike is not settled by that time, then the probability is that manufacturing volume will begin very quickly to curtail, and — barring later change — will grind toward a dead halt toward the end of October or early November.

When the strike began the steel supply position of most manufacturers was fairly satisfactory. Stockpiles on hand, in warehouse and in transit appeared to add up to an industry average of 30 days, maybe 45. The stickler is in the inventory situations of supplier companies. Their stockpiles are not as long as those of their customers. And, of course, the minute one key supplier has to stop shipments, assembly lines will also be halted.

Ford in Best Position

Those bottleneck points naturally vary with each car and truck maker, and none is sure precisely where they may crop up first. Of all companies, Ford may be in the best position. Its steel mills are operating, under contract with the CIO United Auto Workers. Those mills supply Ford with approximately 50% of company requirements, although not with the widest sheets. Ford may be able to use some of its own production to supply any vendors which might have to close disproportionately ahead of others.

Rumblings of Spottiness

Possible shutdowns in the near term sidetrack once more what might have been a clearer view of the automobile sales picture. Business has been superlatively good at the retail outlet points during the summer. But since labor day there have been rumblings of spottiness. Field stocks are reported accumulating here and there, in specific areas and in specific makes.

If this is true, then a volume month in October—as had been scheduled—would bring stocks to points where they might have begun to be worrisome, what with the winter season setting in. However, continuation of the steel strike would provide this balm in the automotive Gilead—it would sidestep any need of slackening output due to lowered demand. Output would be slackened just the same, of course, but the car companies would not have to admit any clouds on their hitherto bright horizons.

Record Production Continues

Production, meanwhile, has continued to hold in record ground for this time of year. The turn into October saw volume in U. S. and Canadian plants at a level of approximately 150,000 assemblies a week. The August total of 684,956 was the highest for that month in automotive history; and September's level, around 650,000, also appeared to be a high water mark for that month.

Employment has kept pace with manufacturing in Michigan. September saw payrolls in the Detroit area at their best level in eight months. Outstate hirings were modestly on the upgrade, in tune with the cheerful music out of Detroit.

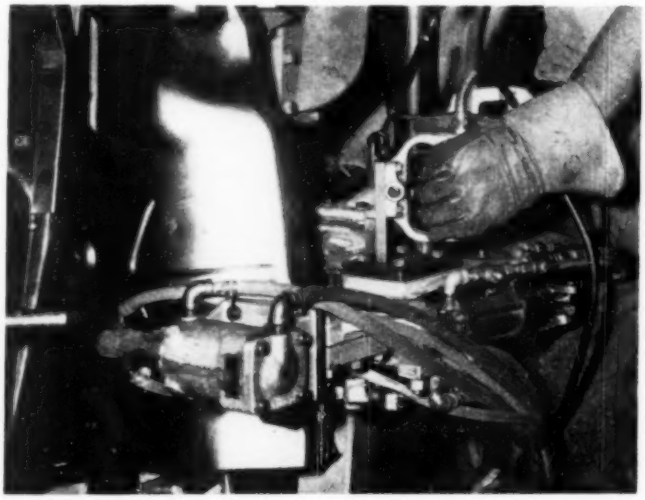
Despite fears of steel strike-induced shutdowns, most of the manufacturers have already set one kind of production record or another this year. One example is Chrysler Corp., which built its millionth vehicle this year on Sept. 27—a full 37 days ahead of the best showing in that respect in the past, in 1937. Last year at Sept. 27 Chrysler division had produced 725,843 vehicles.

More UAW Pension Plans

The Ford pension plan immediately galvanized into action plans of other UAW locals to follow suit. One interesting application will be at Toledo, where the auto union will seek to bring all the plants of that city into a blanket pension arrangement. UAW has approximately 125 agreements in the area, with about 50,000 members.

Thus, smaller companies would be brought into a pool whose provisions they could not afford to maintain themselves. This will undoubtedly stir up distaste from larger companies. They, UAW blandly explained, can have their private plans if they so desire—but the provisions will have to match those at Ford, if not better them.

In Lansing, Olds Motor Div. is getting ready to move into a new assembly plant which will be operating by mid-November, providing better facilities and enlarged output potential. One highly interesting feature is a network of conveyor systems which will bring parts and subassemblies from manufacturing buildings, some of them a quarter mile or more away, direct to the places on the final assembly line where they will be used.



***A NEW LOCKING DEVICE** for the air cylinder control of a horse shoe gun won a $1000 U.S. Savings Bond for William Sabo, electrician at General Motors' South Gate, Calif., plant. Welding tips are prevented from unlocking during spot welding operation by 1½ in. ID cylinder assembly. Previously worn springs allowed gun to open during welding, burning metal and tips. 120 lb air pressure in air cylinder holds the lock in place by 2½ in. cylinder thrust. The locking device is shown above directly below the operator's glove*

Names in the News

Ben F. Bregi

Ben F. Bregi, executive engineer with National Broach & Machine Co., Detroit, accompanied by **Charles C. Clinton,** sales engineer, is now in Europe for an extended visit with automotive, machine tool and marine engine manufacturers there. Mr. Bregi will lecture on modern methods of gear manufacture before engineers and production men in all chief industrial centers of Europe.

William F. Chase, president and treasurer of Bearing Service Co., Pittsburgh, has been elected president of the Smaller Manufacturers' Council of Pittsburgh. Other officers elected: **E. M. Rodenbaugh,** first vice president; **D. D. Munroe,** second vice president; **L. L. Vayda,** secretary, and **H. A. Calderwood,** treasurer.

Frank G. Helander

Frank G. Helander has been named executive vice president of Watson-Stillman Co., Roselle, N. J. He joined Watson-Stillman in 1943 as mid-west sales manager of the hydraulic machinery div. with headquarters in Chicago. Previously he was with Carnegie-Illinois Steel Corp., Gibbs and Hill, consulting engineers of New York, and the Reading Co., Philadelphia.

Bertram Miller, assistant manager of General Electric Co.'s Erie Works, has been named works manager, succeeding **H. L. R. Emmet,** who retired Oct. 1 after 21 years as works manager. During Mr. Emmet's tenure, the Erie Works grew from a plant of 4600 persons to a peak employment of 11,000 during World War II and a post-war peak of more than 18,000. Mr. Miller was assigned to Erie in 1926, in 1931 was named assistant superintendent of the control division, in May, 1935, was named assistant supervisor of the central planning and wage payment div., and two months later became supervisor of the division. He was named assistant to the works manager in 1942 and on Jan. 1, 1949, was named assistant works manager.

William K. Stamets, Jr., on the Cornell University faculty for the past two years, has opened an office as a consulting mechanical engineer at Seattle, Wash. He is a vice president and director of the William K. Stamets Co., Pittsburgh and Cleveland.

William J. Sparling, works manager of the chain & transmission div., Chain Belt Co., Milwaukee, has been elected vice president and manager of the division. **E. P. Meyer** succeeds Mr. Sparling as works manager. **Roscoe O. Byers** has been named factory manager of the division, **Clarence B. Ringham** has been named factory manager of heavy machinery divisions, and **George B. Flanigan** has been appointed manager of trade relations.

Alonzo J. Edgar has been named general manager of Hunt-Spiller Mfg. Co., Boston. Since 1946 he has been works manager of Benton Harbor Malleable Iron Co. In 1942 he was appointed technical director and co-manager of the Gray Iron Founder's Society.

George W. Altman has been named plant manager of the Trenton, N.J. cast iron radiator foundry of National Radiator Co., Johnstown, Pa., succeeding **E. W. Longacre,** retired because of ill health.

H. P. Ladds, president of National Screw & Mfg. Co., Cleveland, has been elected to the board of Lock Thread Corp., Detroit, succeeding the late **Charles F. Newpher.**

Kenneth H. MacWatt has been named director of engineering sales of L. O. Koven & Brother, Inc., Jersey City, N. J., succeeding **W. D. Birch,** resigned.

Elmer J. Mlinar

A. Charles Amann

Elmer J. Mlinar has been named assistant works manager and **A. Charles Amann** has been named industrial sales manager of the Stamford div. of Yale & Towne Mfg. Co., New York. Mr. Mlinar's previous positions included general plant manager of the Kindt-Collins Co., and general plant manager of the Houma div. of Weatherhead Co. Mr. Amann came to Yale & Towne in July, 1949, from Illinois Lock Co., Chicago, where he served four years as vice president and director of sales and advertising.

Ray M. McLean has been elected president of Jaeger Machine Co., Columbus, Ohio, succeeding **O. G. Mandt,** who resigned as president. Mr. Mandt will remain on the board of directors. **Howard W. Earnshaw,** plant manager, was named vice president. **Gebhard Jaeger** was re-elected chairman of the board.

Dr. Paul D. Merica, executive vice president of International Nickel Co. of Canada, Ltd., was elected a director of Babcock & Wilcox Co.

M. K. Peck has been named by The Bullard Co., Bridgeport, to supervise and activate sales of the recently acquired Bullard-Universal horizontal boring machine line. He was formerly with William Sellers & Co., Philadelphia, and Consolidated Machine Tool Corp., Rochester.

Milton T. Carleton

Milton T. Carleton has been named works manager of Cleveland Crane & Engineering Co., Wickliffe, Ohio. He was formerly works manager of the Cleveland division of E. W. Bliss Co. for 14 years.

Dr. Eugen Sovegjarto, welding alloys research expert formerly employed by leading metallurgical concerns in Germany, has joined the research staff of Eutectic Welding Alloys Corp., New York.

Elliott C. Paddock has been named to a newly created post of vice president in charge of sales of Graton & Knight Co., Worcester, Mass. Since 1939 he was general sales manager of Corbin Screw div., American Hardware Corp., New Britain, Conn., and for 15 years prior to 1939 was field sales manager in charge of domestic sales for Greenfield Tap & Die Corp.

Clayton P. Innes has been named manager of the Davenport, Iowa, branch office of Cutler-Hammer, Inc., Milwaukee. He succeeds **E. J. Karl,** retired.

Harvey S. Peters

Harvey S. Peters has been named central district sales manager with headquarters at Detroit, for Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. He succeeds the late **A. E. Ulrich.**

Hugh Dean, Carl H. Kindl, Wilbur H. Norton, and **Elis S. Hoglund** have been elected vice presidents of General Motors Corp., Detroit. Mr. Dean will be in charge of the manufacturing staff, Mr. Kindl will head Canadian and overseas operations, Mr. Norton will head a new activity having responsibility for the development of policies and procedures in connection with parts merchandising, including supervision of the United Motor Service division, and Mr. Hoglund will continue to serve as assistant general manager of the GM overseas operations division in charge of its manufacturing plants abroad. Mr. Kindl, **Cyrus R. Osborn** and **Edward B. Newill** were elected members of the administration committee. **James L. Conlon,** resident manager of the Ternstedt plant in Columbus, Ohio, has been named general manager of the Ternstedt division, succeeding **John W. Jackson,** who is now on leave of absence. **Paul L. Jones,** works manager of the Ternstedt plant, succeeds Mr. Conlon as resident manager. **Daniel F. Hulgrave** has been named director of the procurement and schedules section of GM, succeeding **Roger M. Kyes,** who has been named assistant general manager of the GMC truck and coach division at Pontiac.

Obituaries

Robert A. Weinhardt, who since Aug., 1947, had been in charge of all engine design at Willys-Overland Motors, Inc., died Sept. 26. He was successively with Henry Motor Car Co., Continental Motors, Packard Motor Car Co., and in June, 1945, joined Graham-Paige to design the chassis for the Kaiser-Frazer line.

William C. Briggs, 71, for 33 years a mechanical goods salesman for the Pittsburgh branch, United States Rubber Co., New York, died Oct. 3.

Warren G. Jones, 33, vice president of W. A. Jones Foundry & Machine Co., Chicago, died Sept. 16.

James H. Spade, district sales manager for Allegheny Ludlum Steel Corp., died Sept. 9.

Warren J. Hannum, 65, a former associate of Gisholt Machine Co., Madison, Wis., for over 35 years, died recently. His first job was with Gisholt in Madison. In 1908 he was made general manager of the Warren, Pa., plant. In 1921 he was named general manager of the Milholland Machine Tool Co., but returned to Gisholt when the company bought out Milholland. In June 1940 he joined the Libby division of International Detrola Corp., where he was vice president and general manager until his retirement.

Business Items

Mall Tool Co., Cincinnati, has taken title to the former car-house property of the Cincinnati Street Railway Co. The building, acquired for $37,000, will permit the company to expand its activities.

Propper Products Co., Kent, Ohio, has received a new contract for the design and manufacture of wire and fabric weaving machines developed by the firm. The contract calls for additional equipment to be used in connection with the machinery. Design and experimental work is being carried on by the Kent firm, but equipment manufacture will be subcontracted to other firms.

Jack & Heintz Precision Industries, Inc., has received an award from the Air Force for $1,303,817 of starters for Jet engines.

American Machine & Foundry Co., New York, has acquired DeWalt, Inc., Lancaster, Pa., manufacturer of radial woodworking machines. AMF will continue the operation of the DeWalt plant at Lancaster with the same personnel.

Kaiser Fleetwings, Inc., Oakland, Calif., has changed its name to Kaiser Metal Products, Inc. The firm has just completed a new $2 million enameling plant at its factory in Bristol, Pa. The change marks an extensive conversion program which has taken the firm entirely out of the manufacture of aircraft components and into the production of consumer goods and automobile parts. Kaiser and Sears, Roebuck & Co. have completed a working arrangement whereby the Kaiser plant at Bristol will manufacture porcelain enamelware for the mail order house on a long term basis.

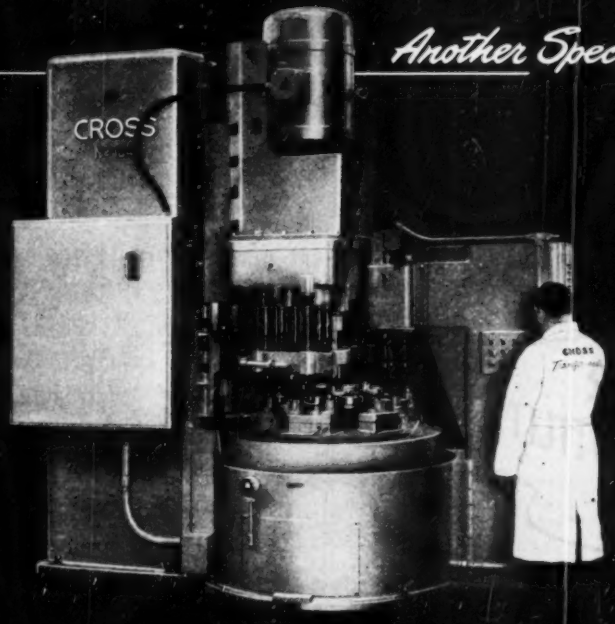
Case Crane & Kilbourne Jacobs Co., Columbus, Ohio, a subsidiary of Jeffrey Mfg. Co., has changed its name to Kilbourne & Jacobs Mfg. Co.

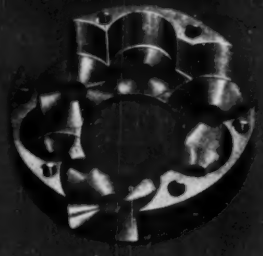
Tin Research Institute, Inc., 492 W. Sixth Ave., Columbus, Ohio, has been organized to provide free technical service to users of tin in the United States.

Link-Belt Co., Chicago, has formally opened its modern new manufacturing plant built on a ten-acre plot at 3203 South Wayside, Houston, Texas. The plant proper consists of a modern machine shop, structural steel shop and large warehousing facilities.

Clark Equipment Co., Buchanan, Mich., has completed a new factory at Jackson, Mich., bringing the production of Clark's line of transmissions, farm tractor drives, gears and forgings under one roof.

Another Special by Cross





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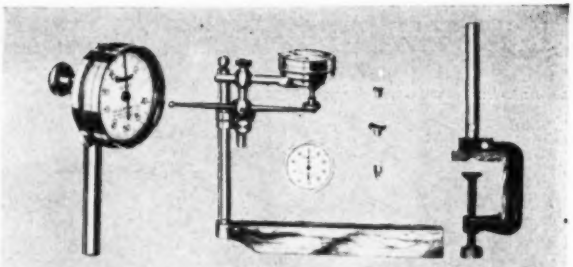

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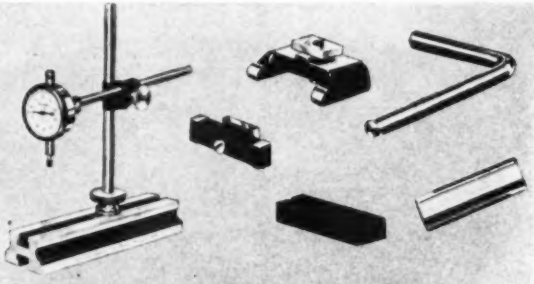

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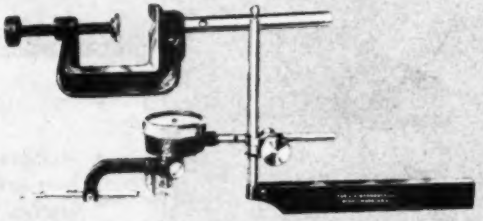

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Selection Chart for Deep-Drawing Dies...I

COURTESY: THE BRIDGEPORT BRASS COMPANY

BY USE of the chart on page 123 the die designer can lay out a series of drawing dies so the appropriate reduction in area per draw is achieved for material involved, type of operation and required properties of the shell. This chart can be used for these non-ferrous materials: 66-34 brass, 70-30 (cartridge brass), 85-15 and 80-20. The 95-5 and 90-10 alloys are generally redrawn without thinning the cup wall, because high-copper alloys lack tensile strength to withstand punch pull.

The chart is also applicable to silicon-bronze, except that one-half of the normal 30% reduction must be used for the final operation in order to maintain uniform wall thickness temper.

In this chart, reduction in area does not refer to reduction in total cross-sectional area of the shell, but instead the reduction of the cross-sectional area of the shell wall.

Example: What die sizes are required to produce a flashlight case 1½ in. in dia. by 0.015-in. wall thickness? Calculated blank size is 4½-in. dia. by 0.037 in. thick.

Step 1—Mark the chart at the intersection of the vertical line representing 4½-in. dia. and the horizontal line coinciding with metal thickness of 0.037 in.

Step 2—To find the cupping die size, move left from point 1 to the 44% reduction-in-area curve, and thence downward, so it is found that a 2½-in. cupping die will be satisfactory.

Note: Normally a reduction in area of 40-45% for brass can be assumed for cups, but reductions up to 49% can be used by paying special attention to tooling and equipment. Percentage of reduction on thin-metal cups should be kept near 40% as a general rule.

Step 3—Determine the number of draws. Count the spaces between curves from the size of cup diameter at point 2 and the finish-drawn size at point 6. Twelve spaces are noted. A reduction in area of only about 30% is practical for each redraw operation. The chart shows that three spaces are equivalent to a reduction of 29%. Hence, twelve spaces divided by three spaces yields four draws as necessary to make the shell.

Step 4—To select draw die sizes, connect points 2 and 6 with a smooth curve, not a straight line. The ideal curve would be perpendicular at intersections with the reduction-in-area curves. In this case, the curve as drawn favors this proposition only near points 2 and 3.

Point 3 on the curve (three spaces) is equivalent to a first-draw size of 2⅛-in. dia. by 0.031-in. wall thickness.

Point 4 on the curve (the second three spaces) is equivalent to a second-draw size of 1 13/16 x 0.026 in. wall thickness.

Point 5 on the curve (another three spaces) coincides with a third draw size of 1⅝ in. by 0.019 in. wall thickness.

Point 6 of course represents the final draw size of 1½x0.015 in.

Customarily, a greater amount of reduction is applied at the first and second draws, resulting in say the use of 3½, 3½, 3 and 2 spaces on the curve instead of equal steps of 3 spaces. However, the observance of this nicety in practice should depend on whether the resulting draw-die sizes can be worked out to dimensions of potential further use on subsequent jobs.

With a 30% reduction per draw, a shell about ¾ hard will be produced. Hence, to permit subsequent redrawing it is necessary to anneal and pickle between drawing operations. And if the shell must be less than ¾ hard, use reductions of 1, 2 or 2½ spaces, depending upon requirements. Sometimes, greater hardness (or temper) may be wanted in the finished shell. A higher final reduction will achieve this requirement.

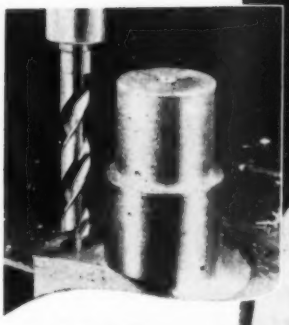
The chart can also be used when a big cup must be folded; that is, redrawn without thinning the wall. From point 2 merely step off the equivalent of 30% reductions, moving horizontally to the left. However, sleeve-type drawing will probably be required. This does not pertain to eyelet or multiple-plunger machines where a 41% reduction in the cupping operation and 15% reductions for succeeding draws, with no intermediate anneals, is common practice.

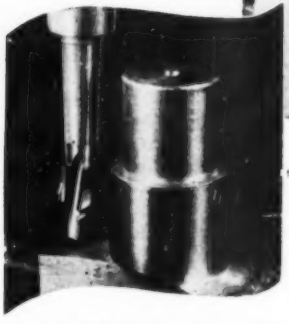
Other Cases:

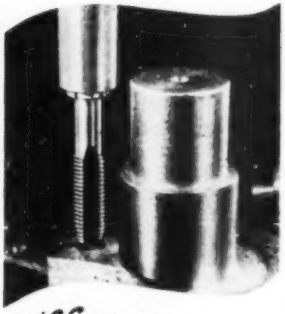
1. Shells with a thick bottom and uniform wall—Use up to 45% reduction of blank diameter to cup diameter for material up to ⅛ in. thick. Above ⅛-in. thickness, the type of equipment will influence the reduction.

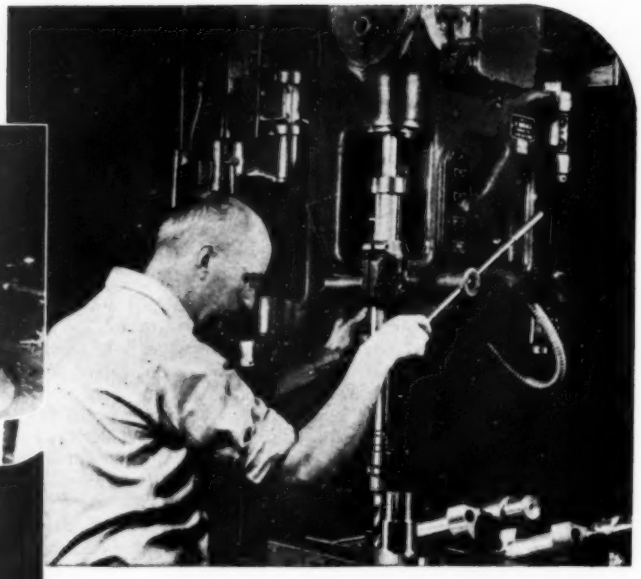
2. The chart can be used to lay out draw-die sizes so the wall thickness is reduced say 25 to 30% per operation and only about 5% reduction in diameter. In this case, the construction curve will not be perpendicular to the reduction-in-area curves. This is good practice only when working with heavy-gage materials.

3. The chart can be used for work larger than 10-in. diameter by multiplying the readings by 10, because a logarithmic scale is used.









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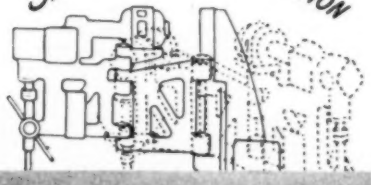
Speed and ease of operation is the big feature of Footburt-Hammond Radial Drilling Machines. The unique hinged bracket construction makes it possible to swing the drill head quickly from hole to hole. And the wide range of speeds is instantly available to take care of small or large tools. Tapping reverse is electrically operated by means of a separate hand lever; no additional adjustments required when changing for drilling to tapping. In-the-line operations may be handled faster with the handy machine.

SWINGS TO ANY POSITION

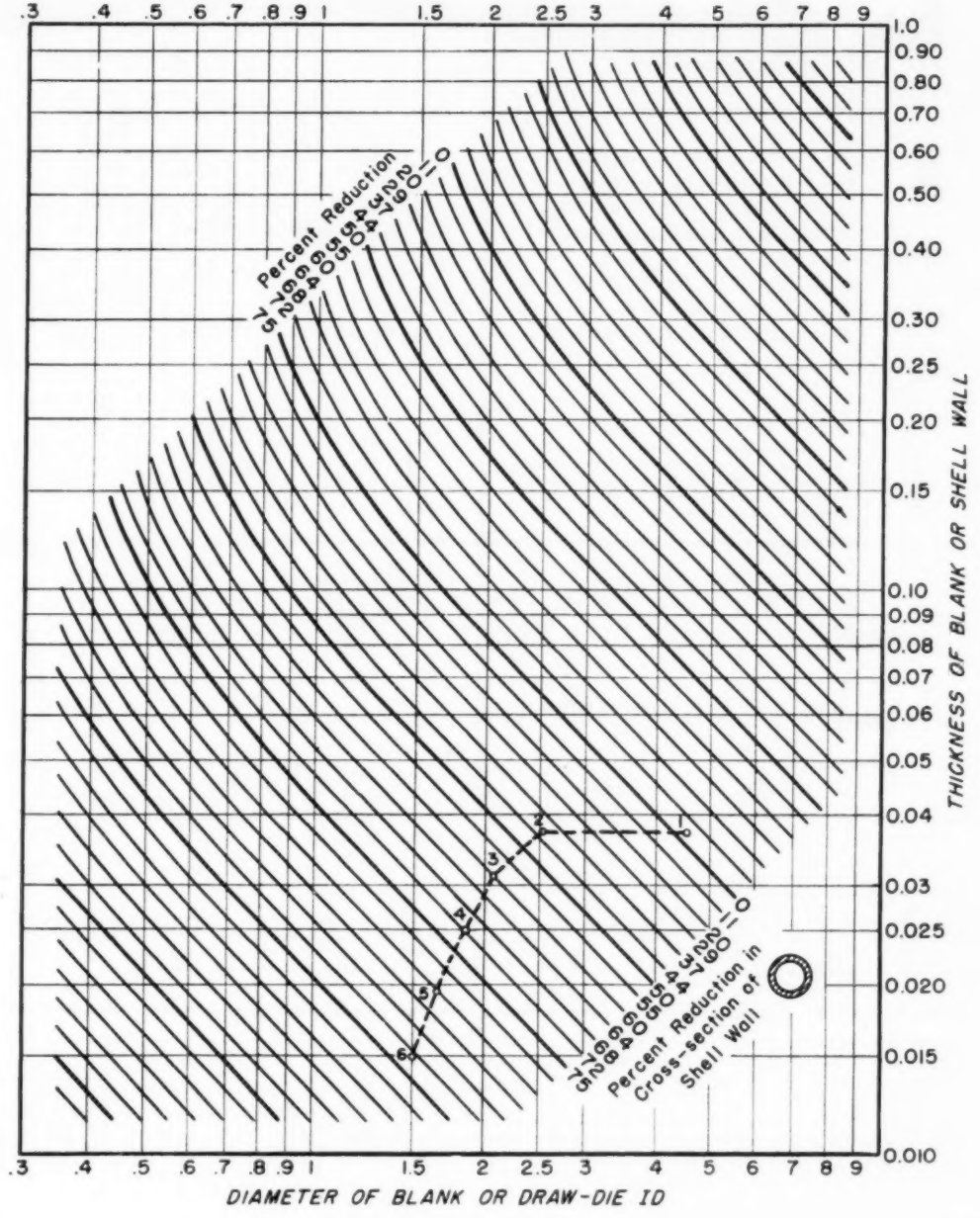


THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

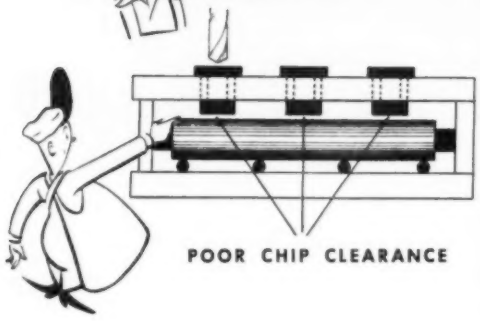
FOOTBURT-HAMMOND RADIAL DRILLING MACHINES

Selection Chart for Deep-Drawing Dies...II



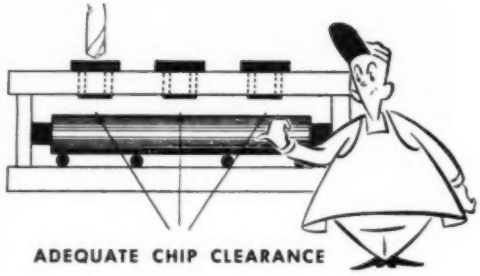
Design of Drill Bushings is Important

Stainless Sam says



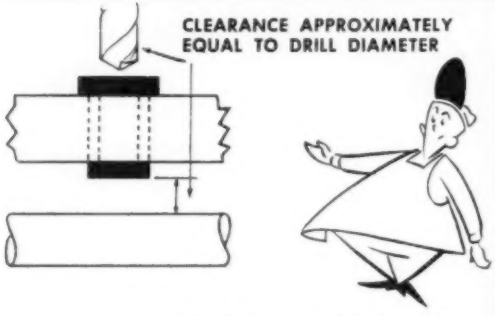
POOR CHIP CLEARANCE

1 A screw machine shop was having trouble with poor drill life and poor chip clearance. Stainless Sam learned the job called for transverse drilling of ¼"-diameter holes in 1¾"-diameter stainless steel bars. The sketch shows the original set-up of the jig.

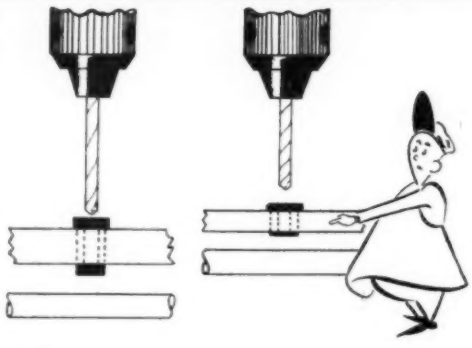


ADEQUATE CHIP CLEARANCE

2 This sketch shows the changes in bushing design recommended by Stainless Sam. ***Drill bushings were ground away*** to permit adequate chip clearance. This also eliminated the cause of excessive drill-breakage. In the original design, where chip clearance was inadequate, the drill was ***forced to recut its own chips.***



3 When machining stainless steels, the minimum clearance between the bottom of the bushing and the work piece should be at least equal to the diameter of the drill, according to Stainless Sam. For example, a ¼"-diameter drill should have chip clearance of ¼". This may vary slightly with the accuracy of drill-location.



4 Bushings, however, should never be longer than the work requires. They should be as short as good machining practice permits, because short bushings make possible the use of short drills.

Drilling Stainless Steels is only one of the many subjects discussed in Armco's valuable new booklet on machining.

Write for your copy today. It may surprise you to know how easy it is to machine Armco Stainless Steels on standard equipment. And you may be in line for another pleasant surprise if you make a cost study of each part of your product — comparing Stainless with the material you are using.

When you write for a copy of the booklet, just ask for "Machining of Armco Stainless Steels." Address Armco Steel Corporation, 3979 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO
STEEL CORPORATION

ARMCO

Standard Wire Rope

Source: Revised Simplified Practice Recommendation R198 issued by the National Bureau of Standards

6×7 TRANSMISSION *

Diameter In.	Weight Lb. per ft	Breaking strength in tons		
		Improved plow steel	Plow steel	Mild plow steel
1/4	0.094	2.64	2.30	2.00
5/16	0.15	4.10	3.56	3.10
3/8	0.21	5.86	5.10	4.43
7/16	0.29	7.93	6.90	6.00
1/2	0.38	10.3	8.96	7.79
9/16	0.48	13.0	11.3	9.82
5/8	0.59	15.9	13.9	12.0
3/4	0.84	22.7	19.8	17.2
7/8	1.15	30.7	26.7	23.2
1	1.50	39.7	34.5	30.0
1 1/8	1.90	49.8	43.3	37.7
1 1/4	2.34	61.0	53.0	46.1
1 3/8	2.84	73.1	63.6	55.3
1 1/2	3.38	86.2	75.0	65.2

6×19 HOISTING *

1/4	0.10	2.74	2.39	2.07
5/16	0.16	4.26	3.71	3.22
3/8	0.23	6.10	5.31	4.62
7/16	0.31	8.27	7.19	6.25
1/2	0.40	10.7	9.35	8.13
9/16	0.51	13.5	11.8	10.2
5/8	0.63	16.7	14.5	12.6
3/4	0.90	23.8	20.7	18.0
7/8	1.23	32.2	28.0	24.3
1	1.60	41.8	36.4	31.6
1 1/8	2.03	52.6	45.7	39.8
1 1/4	2.50	64.6	56.2	48.8
1 3/8	3.03	77.7	67.5	58.8
1 1/2	3.60	92.0	80.0	69.6
1 5/8	4.23	107.0	93.4	81.2
1 3/4	4.90	124.0	108.0	93.6
1 7/8	5.63	141.0	123.0	107.0
2	6.40	160.0	139.0	121.0
2 1/8	7.23	179.0	156.0	— —
2 1/4	8.10	200.0	174.0	— —
2 1/2	10.00	244.0	212.0	— —
2 3/4	12.10	292.0	254.0	— —
3	— —	— —	— —	— —
3 1/4	— —	— —	— —	— —
3 1/2	— —	— —	— —	— —

8×19 HOISTING†

Weight Lb. per ft	Breaking strength in tons	
	Improved plow steel	Plow steel
0.09	2.35	2.04
0.14	3.65	3.18
0.20	5.24	4.55
0.28	7.09	6.17
0.36	9.23	8.02
0.46	11.6	10.1
0.57	14.3	12.4
0.82	20.5	17.8
1.11	27.7	24.1
1.45	36.0	31.3
1.84	45.3	39.4
2.27	55.7	48.4
2.74	67.1	58.3
3.26	79.4	69.1

6×37 HOISTING *

0.10	2.59	2.25
0.16	4.03	3.50
0.22	5.77	5.02
0.30	7.82	6.80
0.39	10.2	8.85
0.49	12.9	11.2
0.61	15.8	13.7
0.87	22.6	19.6
1.19	30.6	26.6
1.55	39.8	34.6
1.96	50.1	43.5
2.42	61.5	53.5
2.93	74.1	64.5
3.49	87.9	76.4
4.09	103.0	89.3
4.75	119.0	103.0
5.45	136.0	118.0
6.20	154.0	134.0
7.00	173.0	150.0
7.85	193.0	168.0
9.69	236.0	205.0
11.72	284.0	247.0
13.95	335.0	291.0
16.37	390.0	339.0
19.00	449.0	390.0

* *For these ropes with steel cores, add 7½% to the above strengths. For these ropes when galvanized, deduct 10% from the above strengths.*

† *For these ropes with steel cores, add 10% to the above strengths, and 20% to the above weights. For these ropes when galvanized, deduct 10% from the above strengths.*

5×19 MARLINE-CLAD TRANSMISSION *

Diameter, In.		Weight Lb. per ft	Breaking strength in tons	
Before serving	After serving		Plow Steel	Mild plow steel
1/4	9/16	0.21	2.17	1.89
5/16	5/8	.28	3.37	2.93
3/8	11/16	.36	4.82	4.20
7/16	3/4	.42	6.53	5.68
1/2	13/16	.51	8.50	7.39
9/16	7/8	.62	10.7	9.31
5/8	1	.81	13.2	11.4
3/4	1 1/8	1.10	18.8	16.4
7/8	1 1/4	1.32	25.5	22.1
1	1 3/8	1.70	33.1	28.7
1 1/8	1 1/2	2.12	41.6	36.2
1 1/4	1 5/8	2.58	51.1	44.4
1 3/8	1 3/4	3.14	61.4	53.4

* *For these ropes with steel cores, add 7½% to the above strengths. For these ropes when galvanized, deduct 10% from the above strengths.*

6×25 TYPE "B" FLATTENED STRAND *

Diameter In.	Weight Lb. per ft	Breaking strength in tons	
		Improved plow steel	Mild plow steel
3/8	0.25	6.71	
1/2	.45	11.8	8.94
9/16	.57	14.9	11.2
5/8	.70	18.3	13.9
3/4	1.01	26.2	19.8
7/8	1.39	35.4	26.8
1	1.80	46.0	34.8
1 1/8	2.28	57.9	43.8
1 1/4	2.81	71.0	53.7
1 3/8	3.40	85.5	
1 1/2	4.05	101.0	
1 5/8	4.75	118.0	
1 3/4	5.51	136.0	
2	7.20	176.0	
2 1/4	9.10	220.0	
2 1/2	11.20	269.0	
2 3/4	13.60	321.0	

6×30 TYPE "G" FLATTENED STRAND *

5/8	0.70	18.3	13.9
3/4	1.01	26.2	19.8
7/8	1.39	35.4	26.8
1	1.80	46.0	34.8
1 1/8	2.28	57.9	43.8
1 1/4	2.81	71.0	53.7
1 3/8	3.40	85.5	
1 1/2	4.05	101.0	
1 5/8	4.75	118.0	
1 3/4	5.51	136.0	
2	7.20	176.0	
2 1/4	9.10	220.0	
2 1/2	11.20	269.0	
2 3/4	13.60	321.0	

6×8 TYPE "D" FLATTENED STRAND

1/2	0.45	11.1	8.37
5/8	.70	17.1	12.9
3/4	1.01	24.4	18.5
7/8	1.39	33.0	24.9
1	1.80	42.7	32.3
1 1/8	2.28	53.5	40.5
1 1/4	2.81	65.5	49.5
1 3/8	3.40	78.6	59.4
1 1/2	4.05	92.7	70.1

* *For these ropes with steel cores, add 7½% to above strengths.*

Notes:

Wire rope for industrial hoisting purposes is made in the following forms:

Standard—6x19. This consists of six strands of 19 wires, the strands being twisted around a hemp or steel core.

6x37—Made of finer wire than 6x19 to permit bending over smaller sheaves, but does not resist wear as well as 6x19.

8x19—Again an extra-pliable rope with smaller wires than standard rope.

Flattened strand—The three listed sizes have increased wearing area as compared with standard lay, because the strands are flattened.

Wire rope for transmission purposes is made in several forms:

6x7—The coarse wires withstand greater wear than hoisting rope, must be used on large sheaves.

5x19—marline-clad rope is served with marline for abrasion resistance.

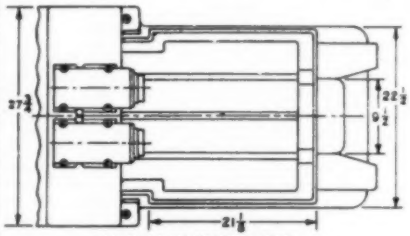
Generate straight bores, outside diameters and an unlimited number of different contours. Adaptable to both roughing and extreme precision finishing of pieces, limited only by the minimum diameter of the boring bar, and on large work by the table size. Operate at top spindle speed of 7500 R.P.M. Two speed drive makes it possible to change spindle speeds for different portions of the same job, to provide for differences in diameters and interrupted cuts.

Available in two sizes of two different models, one for straight boring and turning, the other equipped with contour table. One or more spindles may be mounted, and raised, lowered or spaced as required. Vertical cross slides optional for facing or other cross working operations.

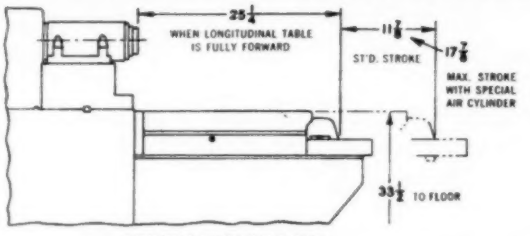
BETTER METHOD	Prevents fluctuation in size and feed caused by temperature variations.
BETTER METHOD	Only one single point tool to buy, set, adjust and grind.
BETTER METHOD	Holds .0001 tolerances by reducing tool strain and work torque.
BETTER METHOD	Positive cam actuation reduces inspection to a single dimension.
BETTER METHOD	Rapid traverse to within a few thousandths of work, quick withdrawal, cut idle time.
BETTER METHOD	Optional automatic loading enables one operator to run more than one machine.
BETTER METHOD	Choice of tool or work rotating set-up makes tooling easy and flexible.

LARGE SIZE TABLE TAKES BIG WORK

Besides doing small work, these machines are capable of mounting large pieces on the tables as shown in the following tooling area sketches



TOP VIEW OF TOOLING AREA



SIDE VIEW OF TOOLING AREA

The work capacity and flexibility of New Britain boring machines open up unlimited possibilities for finding the better production methods on which successful competition stands or falls. Write for full details, and the brochure, "IT CAN BE DONE" which describes actual cost histories on specific jobs.

649MJ1

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

TALKING SHOP

Fringe Issues

ONE MACHINE-TOOL BUILDER has lumped under "Cost of Maintaining the Crew" in its most recent union contract such items as wages, vacations, paid holidays, rest and wash-up periods, night bonus, old-age benefit payments, State unemployment tax payments, Federal unemployment tax payments, and workmen's compensation insurance. Further, he has pointed out that this represents a very substantial portion of the cost of doing business and that full weight must be given to these costs in considering future wage adjustments. The union has accepted this line of reasoning, so when the company had to cut work hours to less than 40 per week recently, union members cooperated by giving up rest and washing periods. This enabled a substantial reduction in direct-labor costs at no monetary sacrifice to the employe.

Flexible Steels

HIGHLY ALLOYED STEELS are being replaced by lower alloys as quickly as possible by one major auto producer. Alloys with comparable hardenability are readily interchangeable in this plant's practice, so steel specifications can now be much more flexible than they were.

Sudden Repair

ONE AUTOMOTIVE manufacturer scrapped all dies for old models during the war, because the dies could not be written off the books otherwise and were expensive taxable assets if kept. When a stock of ancient sheet-metal parts gets down near "one", a plaster pattern is made. Kirksite dies are produced, and a small batch of parts run on them. Without this trick, a number of jalopies would now have no fenders, doors or hoods.

Family Tree

RECOGNITION of long-service employees at the Norton Company includes adding their names to the company family tree. Painted on the front wall of the auditorium, the tree lists the company founders on its roots, other plants of the company on its trunk, ascending in chronological order of their establishment, and all employees with 25 years of service on its branches. No distinction as to rank is made and sweeper and vice president may share the same branch. Since its beginning 15 years ago, the tree has grown until it now encircles the hall.

Drive Stub Forged In

PRACTICALLY all rear-axle shafts for automobiles have a large driving flange at one end. It has become almost universal practice to forge a depression now in the flange center with one or more crossbars, and to provide a driving dog that fits into this. This drive is so secure that six or eight tools can be brought into action simultaneously on turning the shaft and finishing the flange.

Hydraulic Specialists

GENERAL MOTORS INSTITUTE, Flint, Mich., recognizing the increasing complexity of hydraulic elements in machines, has instituted three courses in hydraulics. A 4- to 6-week short course takes care of maintenance men, and apprentice and engineering training courses take care of more detailed training. Recently a 67-year-old grandfather, top maintenance man in one GM division, took the short course.

Engineers get design problems as well as service training because GM knows that a man working with hydraulics must have just as specialized knowledge as the man working with electronic units. The Age of Specialization advances apace, in production as in medicine.

Logs—Plus or Minus

WALTER HOLMES, of the drafting room at Minneapolis-Honeywell Regulator, wrote a yarn for us recently on shop procedure in turning balls. Turns out that Mr. Holmes is a robust 81, is a whiz at math. He took a handbook editor to task for his explanation of logarithms, enclosed a copy of his own explanation, duplicated by M-H for all engineers. The handbook editor replied with four pages of argument. Mr. Holmes went back at him, also explained the advantages of positive-characteristic logs over negative-characteristic logs—and won the argument. Who says only youth is aggressive?

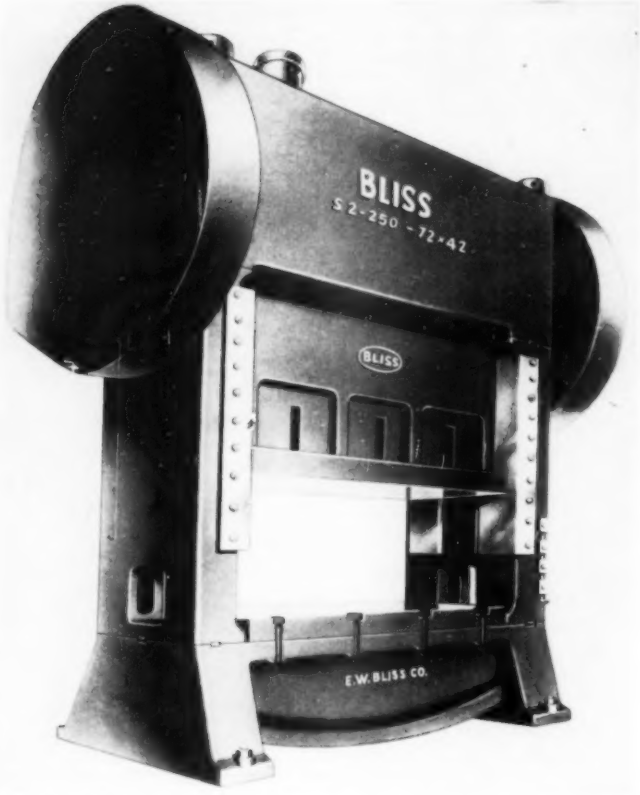
Live Thorns

FRICTION between men is often rooted deep in human feelings and emotions. In one large plant, an old timer became very caustic with his foreman—one of the best in the shop. Probing disclosed that the foreman had failed to express his sympathy at the death of the man's son. Thus revealed, the source of trouble was easily removed. But unintentional slights often create untold difficulties. The golden rule is still the best program for employe relations.

No Leaks—or No Sale

AT A RECENT ASTE MEETING, a member asked, "How can you keep hydraulic lines from leaking?" The speaker replied allegorically: "While I was visiting Grumman Aircraft during the war, I asked a foreman how Grumman kept hydraulic lines free of leaks. He said, 'Ask that Navy inspector over there.' When I asked the inspector, he said, 'If the hydraulic lines leak, they're Grumman's planes, not ours.' So, I've concluded that leaks are determined by what the management will tolerate. Leakage can be stopped—if you see that it's done."

New Shop Equipment



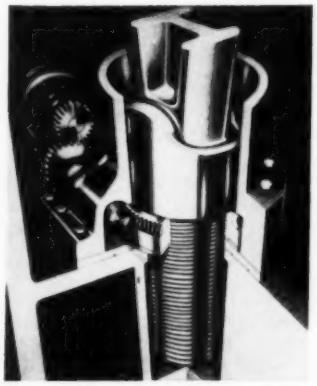
Straight side double-crank press has 250-ton capacity. Both single- and double-crank units are being built by E. W. Bliss Co. with interchangeable parts among press sizes and types

Bliss Press Line Includes Straight Side Machines

Conforming to recently established standards of the Joint Industry Conference, these straight side single- and double-crank presses have frames of four-piece tie-rod construction made of high grade Meehanite castings. Tonnage and weight capacities, and bed and slide areas, are slightly larger than JIC standards. The presses have box-type crowns and slides reinforced by deep internal ribs as well as barrel-type slide adjustments which permit long adjustment to accommodate dies varying greatly in height. Slides remain completely within the gibs at any position of the stroke or adjustment. Power adjustment of slide is standard equipment on all presses.

Single-end drive presses with capacities up to 250 tons have pneumatic friction clutch mounted on the crankshaft. All gears and other drive parts rotate continuously. The only load on the clutch and brake during engagement and disengagement is that required to start and stop counterbalance slide and crankshaft. The Bliss electric control system is standard equipment on the new press design.

E. W. Bliss Co., Toledo, Ohio.



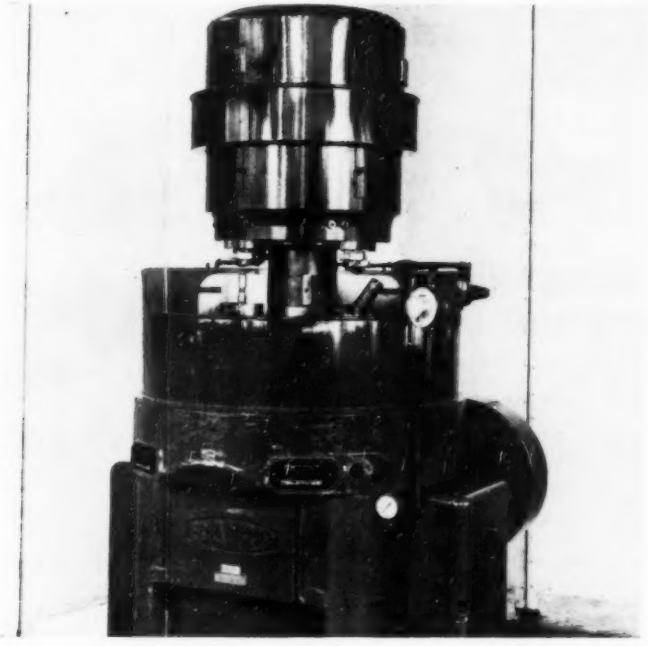
Standard on-the-barrel adjustment on Bliss straight-side presses eliminates the need of ring risers and stools when using dies of greatly varying weight. Adjusting worm has two thrust anti-friction bearings

Milling Cutter Has Carbide Tipped Blades

The Shear Clear face-milling cutter with carbide-tipped blades is for high feed rate milling of cast iron. It embodies the principle of cutting on the bevel portion of the blades which are set into the housing at negative radial and positive axial rake angles. This series of Shear Clears has fine blade space—38 blades in a 10-in. cutter—and is suitable for feed rates up to 75 ipm.

The Ingersoll Milling Machine Co., Rockford, Ill.

Materials and Parts



Four Spindle Vertical Lathe Faces, Chamfers, 900 Pieces Per Hour

Operating continuously with the work and the tools rotating at 4 rpm, the Baird No. 4 vertical lathe can face and chamfer 900 pieces per hour. For this operation one end-mill, adapted for both face milling and chamfering of slip yoke shanks, is mounted on each cutting bar. Two different sizes of work are processed.

Cutting time is 4.1 sec at a work spindle speed of 496 rpm and a work stroke of ¼ in. Cutting speed for end facing is 213 fpm, and for chamfering is 160 fpm. Stock removal is approximately 3/32 in. To facilitate loading and unloading, the work spindle is automatically positioned before it starts rotating. A swivel joint in each holding fixture permits the fixture to be swung out for loading and unloading. When loading work in the fixture a live center, operated through the center of the cutting bar, engages the fixture for added support and also operates the expanding pins in the holding fixture.

These pins centralize the work and assure concentricity. The live center is locked in place by a cam lobe, provision being made to bypass this lobe should there be need to rotate the machine backward. A hand crank is provided to rotate the machine backward manually.

A feed cam controls the cutter bar advances during the cutting cycle. Coolant, supplied either by individual tank or from a centralized system, is confined to the cutting area. The load cycle is kept free of coolant. Chips are washed into a circular trough and out through a discharge chute back of the machine. Coolant is strained and returned to the coolant tank.

The Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.

...INCLUDING

Nipple-making machine automatically cuts and chamfers both ends of stock. Maximum capacity is 98 pieces per min.....page 130

Brakedrum finisher processes 6 brakedrums per min to 30-40 micro-inches RMS.....page 132

Machine tool performs 44 individual finishing operations on cylinder blocks at a rate of 38 blocks an hr.....page 136

Hand-operated press capable of 15-ton impact. Frame is made of strong nickel alloy.....page 138

Shop furnace is easily convertable from semi-muffle to full-muffle oven. Unit operates over 300-2000 F range.....page 140

Heavy duty grinder handles knives up to 200-in. length. Extra wide 5-in. V-ways absorb grinding pressures.....page 134

Throttle valve controls fall of accumulator. It is designed to operate at 1500 to 5000 psi...page 142

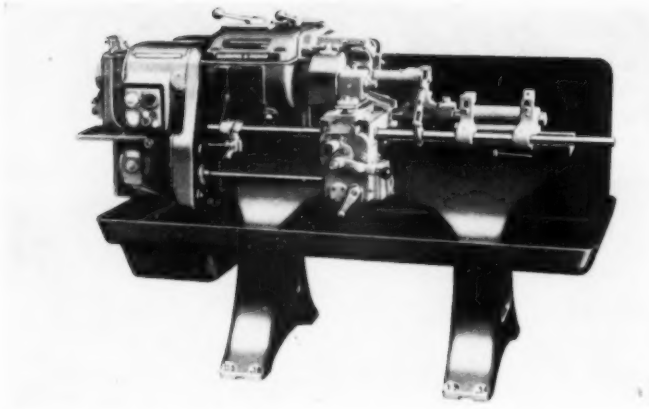
NEW BULLETINS for your Shop Library including a 76-page instruction manual for two chuck type internal grinding machines .....after page 190

...and in November 3

Rotary gear finisher which is completely automatic and will handle spur or helical gears and involute splines up to 24-in. dia.

Ram-type hydraulic broaching machines which may be used interchangeably for surface broaching, internal push-broaching, slotting, and press work.

Production tapping and drilling units operating at 840 rpm for a combination operation consisting of 7/16 in. in tap drilling and ¾ in. in diameter spot facing of bicycle pedal holes.

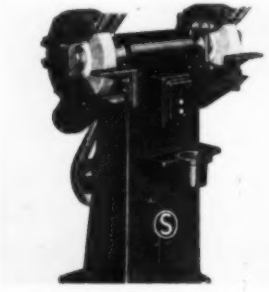


Automatic Nipple-Making Machine Produces 98 Pieces Per Min

Cutting and chamfering both ends, this fully mechanical automatic nipple-making machine produces 98 pieces of smaller size nipple stock per min, and up to 25 pieces of 1½-in. size per min. Range of lengths which can be handled is from ¼ to 12 in. Longer lengths may be produced by operating the machine semi-automatically.

Anti-friction bearing all-geared alloy steel headstocks provide six quick speed changes from 560 to 2280 rpm, handling all nipple sizes from ⅜ to 1½ in. without pick-off gears. Roller cutter slide and chamfering slide are cam-driven from an apron gear box with three quick-feed changes through sliding gears. One chamfering slide cam and two cut-off slide cams are normally sufficient to produce all sizes from ⅜ to 1½ in. The machine occupies a 39x88-in. floor space and weighs 2500 lb.

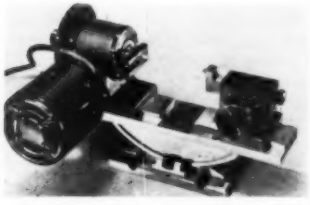
Bardons & Oliver, Inc., 1133 W. 9th St., Cleveland 13, Ohio.



Multi-Speed Grinder Compensates for Wheel Size

The Type BDG multi-speed grinder has three spindle speeds and maintains 6500 sfpm on vitrified bond wheels and 9500 sfpm on resinoid bond wheels. As the wheel reduces in diameter an interlocking arrangement increases the rpm to return the worn wheel to its original speed (fpm) and efficiency. Maximum efficiency can be obtained for wheels as small as 5½ in. in diameter. Models are made in 10-, 12-, and 14-in. sizes.

The Standard Electrical Tool Co., 2480 W. 6th St., Cincinnati 4, Ohio.



Motorized Grinding Centers Mounted on Rocking Bed

Flat, curved, or circular work; straight, tapered, and contour outlines, all within 0.0005 in. can be set up for grinding on the Moore Special Tool Company Motorized Centers, which provides for indexing in the same setting. The unit can be attached to jig bores, jig grinders, drill-presses, light milling machines, and as an inspection tool. The rocking bed on which the grinding center is mounted will swing 20° to either side of the horizontal. The maximum taper angle with an angle plate is 30°. The base plate is dovetailed to permit sliding the head and tailstocks to position. The headstock is equipped with a live center and an index plate with 24 holes, jig drilled to a tolerance of ±.001 in. for spacing.

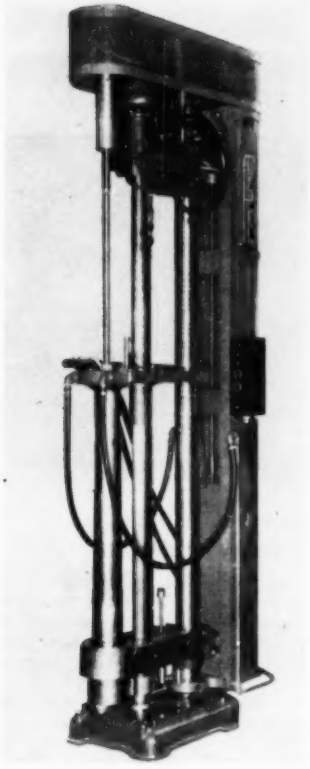
Over-all length of motorized centers is 12 in. Distance between centers is 6 in., and it will swing 6 in. Equipped with a 1/25-hp motor, the complete unit weighs only 34 lb.

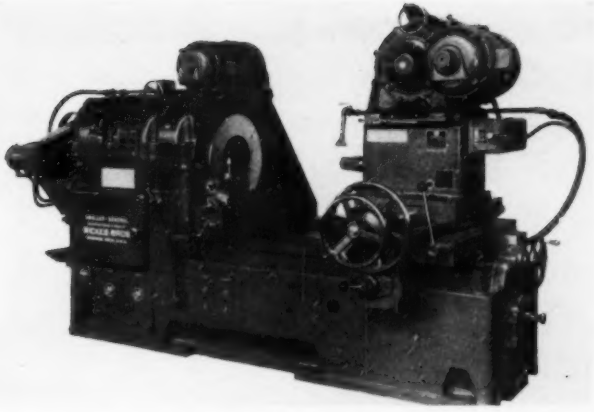
Moore Special Tool Co., Bridgeport, Conn.

Pressed Wood Gears Are Noiseless, Greaseless

"Lignostone" is pressed and impregnated beechwood, said to be harder than Lignum-vitae, tin, or aluminum, and close to that of zinc. Noiseless, greaseless spur and bevel gears made of this material are both grease and gasoline resistant and have uniform hardness. Gears are said to withstand pressure up to approximately 3550 psi. Lignostone is available in solid and laminated blocks and sheets. It has the appearance of ordinary wood and is machined like hardwood to close tolerances and cut with high-speed drills or cutters. Specific gravity is approximately 1.35. In addition to gears, bearings, and leaf springs, a line of Lignostone mallets is also available. Mallets and hammers are made from 8 oz to 2 lb. Lignostone can be supplied in blocks 40 x 4 x 4 in. or sheets 18 x 18 x 4 in. (laminated).

Techno Exports, Suite 2016, 25 Broadway, New York 4, N.Y.





Smalley General Thread Miller Cuts 1 to 28 Threads Per Inch

The No. 30 Smalley general thread miller employs a multiple ring tooth cutter for milling straight and tapered, inside and outside, and right- and left-hand threads. Tapers up to 4 ipf and a range of 1 to 28 threads per in. are possible. The machine comes equipped with 10½- or 15½-in. hydraulically operated three-jaw wedge chucks, or can be fitted with a four-jaw independent chuck, or a faceplate with boring mill jaws. Milling speeds range from 50 to 300 rpm with a range of main spindle speeds from 1.52 to 41 MPR for milling and 3.08 to 83 rpm for turning. Hardened steel ways on the cast-iron bed are powder lubricated. All shafts and spindles run in anti-friction bearings. 15 hp is required to run the main spindle and 7½ hp for the milling spindle.

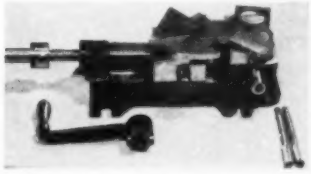
Wickes Bros., Div. of Wickes Corp., Saginaw, Mich.

Vertical Feed Unit Hardens, Quenches Shafts

The P-60 progressive feed unit is for fast surface-hardening of shafts, bars, leadscrews, and fabricated parts up to 5-ft length and 3-in. outside diameter. Entire lengths or select areas of the workpiece may be hardened. Depth of hardness is controlled by regulating speed of the work coil. The unit may also be used for progressively soldering or brazing the seams and joints.

Both heating and quenching cycles are controlled by cut-in and cut-out clamps which start and stop the cycles. A hydraulic variable speed drive controls the speed of ascent and descent of the quench ring assembly. Speed may be varied between 0 and 1.2 ips. A minimum of 30 psi water pressure is usually adequate for quenching operations. A work-spindle drive controls the rotation of the workpiece assuring uniform hardness and depth around the entire surface of the part.

Lepel High Frequency Laboratories, Inc., 39 W. 60th St., New York City 23, N. Y.

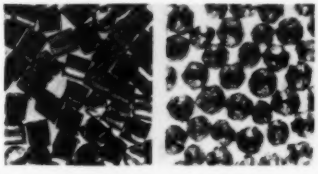


Universal Vise Presents Maximum Contact Surface

To cope with odd-shaped work the "Savo" universal screw vise has three hinged jaws, each of which is divided into several independent layers. A total of 9 jaw parts in the model shown can be positioned and locked to effect a maximum of contact surface on the work. All but the three top pieces move literally as well as in rotation, creating a shelf where necessary, for the workpiece to rest on. Jaws are locked by means of cam-actuating levers which tighten hinging pins of the three jaw units.

Jaws and pins are made of first-class hardened Swedish steel. The vise is available in two models: type 1 with 2½-in. jaws, weighing 13½ lb.; and type 2 with 5-in. jaws weighing 70½ lb. Prices, Type I—$48.30, Type II—$94.80, with reductions for wholesale purchases.

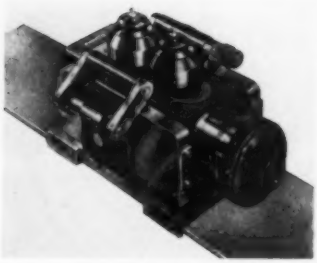
Porath & Magneheim Inc., 95 Liberty St., New York 6, N.Y.



Peening, Cleaning Shot Cut from Wire

"Cutwire Shot" for peening and cleaning is made from high-quality SA 1065 wire and is available in 0.014 to 0.72 in. diameters. Life of this shot is said to be 1500 cycles. It quickly deforms into full round shape (right) of uniform size which is maintained for 98% of its period of use.

Precision Shot Co., 6432 Cass Ave., Detroit 2, Mich.



Width Gage Checks Wire As It Is Processed

The P & W Model B magnetic continuous width gage indicates the diameter or width of continuous rolls of wire or thin strip materials while they are being processed. Variations from predetermined specifications are greatly magnified electrically and shown on the indicating meter. The gage can be used with a control meter to signal the operator, or to automatically make corrective adjustments to maintain predetermined measurements.

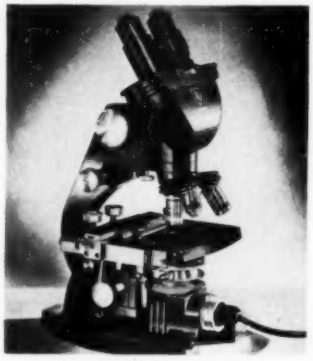
The gage consists of a gage head, slide base, meter, and power unit. Two gaging rules on the gage head are in continuous contact with the wire or material as it passes through the gage. Wire is guided through the gaging rolls by two leveling rolls under tension which flatten out the material and control the passline so that a true measurement is indicated.

Pratt & Whitney, Div. of Niles-Bement-Pond Co., West Hartford 1, Conn.

Sier-Bath Gear Coupling Has Only Seven Parts

Made of forged high-carbon steel and with internal teeth running the full working length, this gear coupling has only seven parts. Because there are no bolts, the sleeve may be removed quickly. A snugly fitting Neoprene seal reinforced with a garter spring keeps oil from leaking out and dirt from entering. The coupling is now made in ¾-, 1-, 1½-, 2-, and 2½-in. sizes.

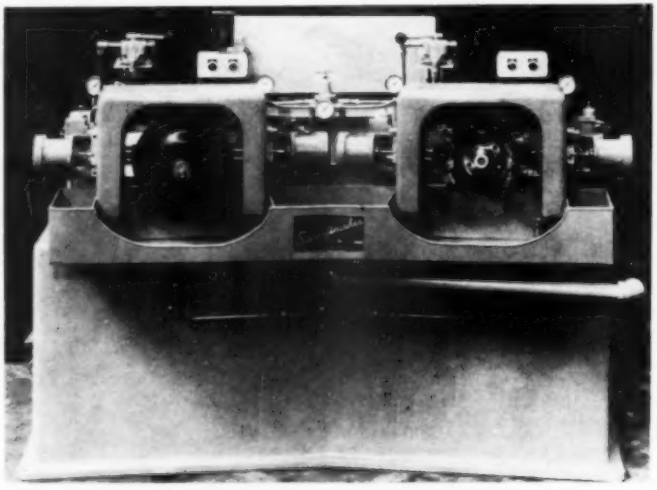
Sier-Bath Gear & Pump Co. Inc., North Bergen, N.J.



Spring Loading Microscope Eliminates Backlash

According to its manufacturers, tests approximating 20 years wear revealed less than 0.2 micron backlash in the micrometer screw fine adjustment of the redesigned AO Spencer Microscope. Among other changes is the addition of a new tension adjustment for setting coarse-focusing and substation controls for as easy or stiff operation as desired. A "pinch grip" mechanical stage permits rapid insertion of slides without danger of disturbing mechanical adjustments. A 10X divisible objective is supplied. It has an N.A. of 0.25 and working distance of 6.8 mm. A dustproof nosepiece centers objectives by means of a ball-and-groove stop. The unit is dual-cone construction.

American Optical Co., Scientific Instrument Div., Buffalo, N.Y.



Two-Station Gisholt Machine Finishes 6 Brake Drums Per Min

Automotive brake drums come to the Gisholt two-spindle brake drum Superfinisher turned to a surface roughness of approximately 150 microinches RMS, and are finished to 30-40 microinches RMS. With one operator, the machine can produce over 6 brake drums per min. Spindles and controls are independent of each other. Each work station consists of a simple arbor and two sets of stones. The two roughing stones and two finishing stones are timed to work together as the brake drum both oscillates and revolves. Stoneholder movement, and clamping of the workpiece are controlled by air. The complete spindle cycle is automatic.

Gisholt Machine Co., Madison, Wis.

Nickel Chromoloy Highly Corrosion Resistant

Durimet 20 was developed during the war for severe corrosive applications that standard 18-8 stainless steels did not withstand. Its most notable application is for handling sulfuric acid. Sheet and plate ranging from 24 gage to ¾ in. are now in production.

Tensile strength is 85,000 psi yield strength, 35,000 psi, and elongation in 2-in. bar (1 dia.) is 35 to 40%. Brinell hardness is 150 to 180. Machinability is 7 to 50% of carbon steel. Weldability is said to be very good.

The Duriron Co. Inc., Dayton 1, Ohio.

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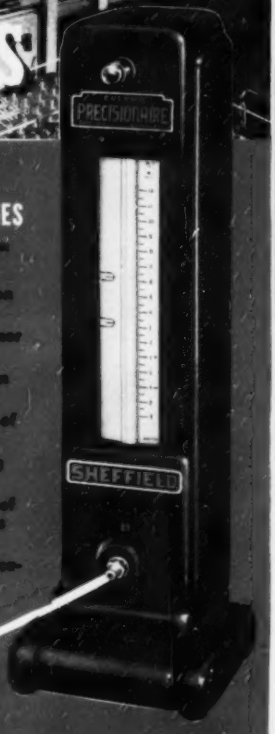

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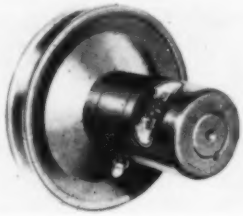
Metal Etching Process Utilizes Ionized Atoms

Cathodic vacuum etching, a process developed by the Ford Motor Co., is said to bring out unusually clearly, metal flow lines which indicate the direction of the metal flow when forged into high pressure. Here's how the system works. The metal sample is placed in a partial vacuum with argon gas and charged with 12,000 volts of electricity. This creates argon ions which bombard the metal surface and knock off minute particles. Flow lines in steel samples, previously undetected, are reported to have been revealed by cathodic bombardment.

Ford Motor Co., Dearborn, Mich.



Control Unit Varies Speed Without Stopping Machinery

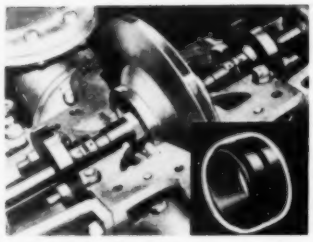
The Reeves Vari-Speed Jr. is a self-adjusting V-type pulley which may be mounted on the shaft of any standard constant-speed motor connecting with V-belt drive to the machinery. As the motor is moved back on a sliding or pivot base, the V-belt rides on a smaller diameter in the expanding pulley decreasing speed delivered. When the motor is moved forward the pulley contracts under spring tension, the belt rides at a greater diameter and the speed is increased. The unit is made in six sizes for motors up to 1½ hp and any A or B V-belt. Speed ratios vary from 1¾ to 2¾:1.

The Reeves Pulley Co., Columbus, Ind.

Dillon Dyna-Switch Protects Hoists from Overload

The Dillon Dyna-Switch slips on to hoist or crane hooks, and loads are lifted beneath it in the usual fashion. The U-shaped tool-steel bar of the switch opens and closes the circuit of the micro-switch as loads are lifted. If hoist capacity is exceeded, the circuit automatically opens, cutting out the motor, preventing the operator from making the lift. The circuit remains open until the operator presses a switch to reverse. Hoist motors up to ¾ hp can be handled directly by the Dyna-Switch, and higher capacities are worked through an intermediate relay. The switch can be set to cut off at any poundage between 500 and 10,000 lb.

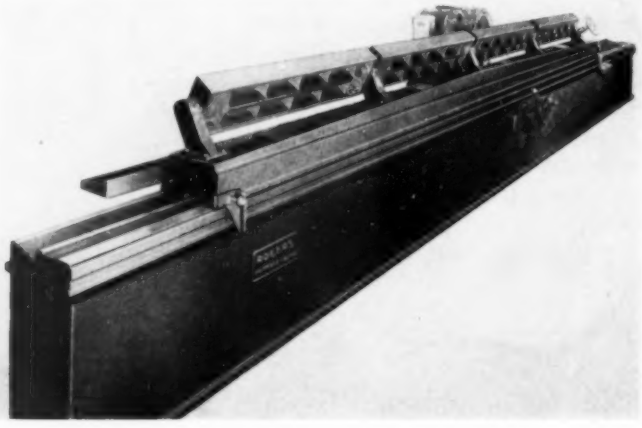
W. C. Dillon & Co. Inc., 5410 W. Harrison St., Chicago 44, Ill.



Self-Lubricating Seal Withstands Corrosive Chemicals

Immune to most chemical attacks, Morganite self-lubricating mechanical carbon seals are for sealing highly volatile fluids under high pressures and continuous service at high speeds. They are said to provide foolproof sealing, free from warping and gumming. Self-lapping and self-polishing, Morganite pressure seal units are available with self-adjusting and wear compensating features. They are recommended for use in pumps, agitators, mixers, and installations handling corrosive volatile or otherwise difficult to handle liquids.

Morganite, Inc., 3302 48th Ave., Long Island City, N.Y.



Heavy-Duty Grinder Handles Knives Up to 220 In.

A straight knife grinder, Model 20, is for end-to-end precision grinding of any heavy chipper knife, shear blade, paper-cutting knife, or doctor blade up to 220 in. in length. 28 ft long and weighing 7 tons, it is equipped with two motors; a 15-hp unit to handle the 20-in. segmental grinding wheel, and a 3-hp motor to guide the traverse carriage. Extra wide 5-in. V-ways in base and carriage absorb grinding pressures and permit heavy cuts and fast feeds without vibration. Slotted knife bars are 10 in. wide with wider bars available. This model is being manufactured in 90-, 100-, 110-, and 134-in. sizes.

S. C. Rogers & Co., 191 Dutton Ave., Buffalo 11, N.Y.

It's TOBIN BRONZE

IF you've done the job right, it's a good weld when you've made it with Tobin Bronze.* This famous ANACONDA Welding Rod has been proving that for decades.

There's an important principle behind this. It's the fact that the low temperatures required with bronze prevent internal stresses from building up. This minimizes the danger of warping or cracking. And when you finish the weld, you get the bonus of bronze's easy machinability.

It's poor business to gamble on a weld when you don't have to. Welders know that where reliability, speed and economy count, they can depend on Tobin Bronze, ANACONDA 997 Low Fuming Bronze and other proven ANACONDA Welding Rods. They are products of The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 49154

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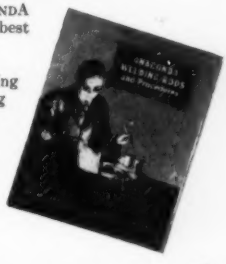

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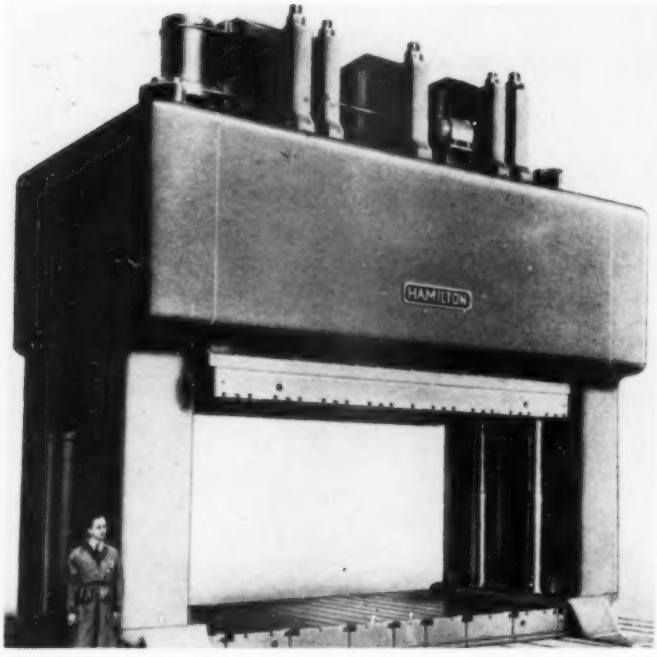
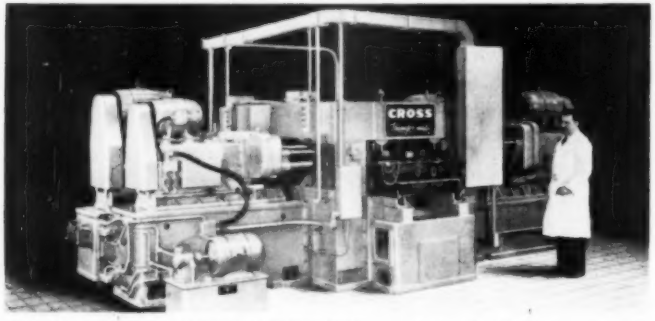


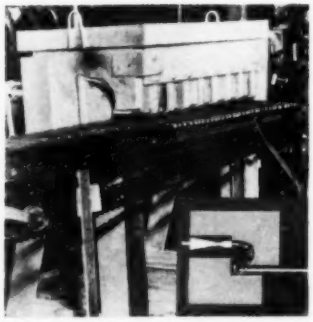
High-Speed Draw Press Stamps Out Automobile Roofs

Taking 6 strokes per minute, this 600-ton Hamilton high-speed triple-action drawing press for stamping out roofs of automobile bodies, forms 70 ft of steel sheet per min. The press can use dies up to 200 in. long and draws to 24 in. depth. The press's plunger slide is in the bed and travels upward when making the draw so that stampings come out of the die right-side up. Several presses of this same high-speed design, about half the size, to be used primarily for drawing outer and inner car door panels, are being built. These will operate at 16 strokes per min.

Lima-Hamilton Corp., Curtis Bldg., Detroit, Mich.



SPECIAL "TRANSFERMATIC" MACHINE TOOL, made by the Cross Co., Detroit, Mich., performs 45 individual finishing operations on cylinder blocks while run by one unskilled operator. Seven crankshaft and four camshaft bearings are rough bored, the oil gallery hole is drilled completely, 21 holes in the front face of the block and ten holes in the rear face are drilled and two locating holes in the rear face are reamed. The machine is designed to process 35 cylinder blocks per hour at 100% efficiency—*The Cross Co., Detroit 7, Mich.*



End Heating Furnace Burns Any Commercial Gas

Operating at high manifold pressures and burning any commercially available gas, the Roto-Flame furnace is used for forging, swaging, upsetting, threading, hardening, and annealing. Ends of the piece being heated are entirely inclosed in flame, thereby limiting scale formation. The unit is supported by heavy structural steel frame and is fired with a large number of small high-pressure burners. Shape of the refractory serves to carry the flame inward instead of letting it escape through the front slot. This both keeps the operator cooler and permits use of the conveyor.

Gas Appliance Service Inc., 1211 Webster Ave., Chicago, Ill.

Grinding Wheel Bonded with Cotton Fiber Resin

Fibrex Red Wheels are manufactured from laminated sheets of cotton fiber filled with abrasive grain. Their field of application is between heavy grinding and light sanding, and for certain types of abrasive cutoff, deburring and finishing operations. They are available in 7- and 9-in. depressed-center type for portable disk sanders, and right-angle type portable grinders. They are also offered in straight wheels, 6, 8, 10, and 12 in. by ⅛-in. thickness.

Simonds Abrasive Co., Tacony and Fraley Sts., Philadelphia 37, Pa.

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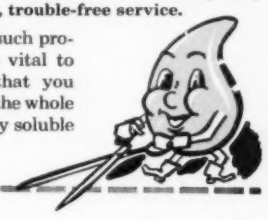

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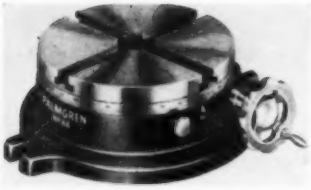


Indexing Head Has 8-In. Diameter Table

Equipped with indexing dial, graduated in 15 min intervals, the Palmgren No. 86 rotary indexing milling table has an 8-in. dia table with two ⅝ x 1⅛-in. T-slots crossing at the center. A 1½-in. reamed hole is situated at the center of the table surface for a locating plug. The table is graduated for full 360° and rotary feed is positive to 40:1 ratio worm and gear. Two hold-down clamps with thumb screws lock the table in position after indexing.

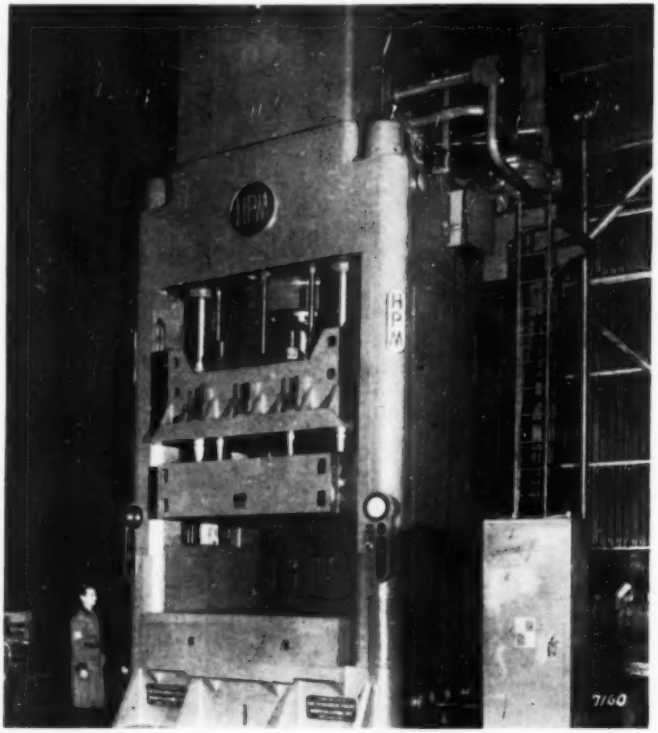
The base is 9¼ in. in dia, and has two bolt and key slots for rigid mounting to milling machines, drill presses, shapers, or surface grinders. Over-all height of the table is 3¼ in.

Chicago Tool and Engineering Co., 8383 So. Chicago Ave., Chicago 17, Ill.

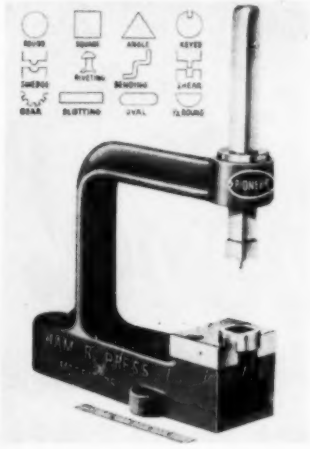
Special Nozzle Line Developed for Paasche Air Guns

A nozzle which delivers a strong, highly localized conical pin-point blast for blowing chip and dirt from deep cavities and slots has been developed for the Paasche air guns. Other nozzles deliver 45° up-blast, flat air sprays, fan blast, and adjustable air streams. Three- and 6-inch extensions are available for use in hard-to-get-to places. The new air guns also include a new handle equipped with a handy hanging hook.

Paasche Airbrush Co., 1909 Diversey Parkway, Chicago, Ill.



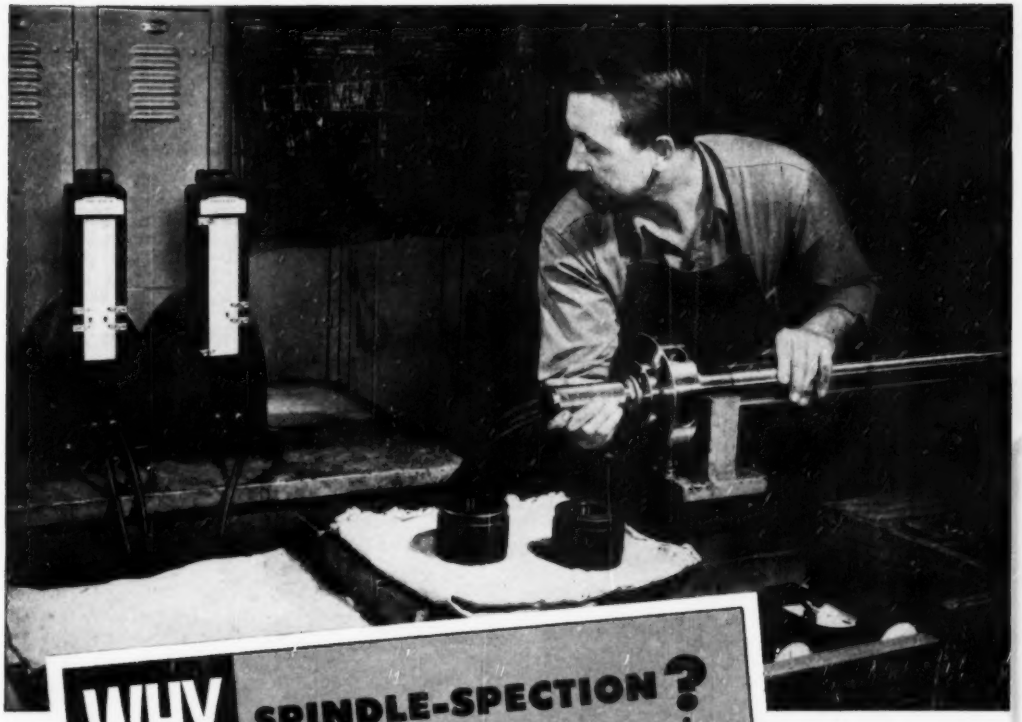
TWO THOUSAND TON HPM double-action hydraulic deep draw press handles deep drawing, forming, and blanking operations on large tractor parts. Equipped with a 500-ton hydraulic blank holder and a 500-ton hydraulic die cushion, this press will draw parts up to 16 in. deep from extremely heavy-gage metal. It weighs 385,000 lb, is 24 ft high and requires a 10-ft deep pit to house that part of the press normally below floor level. The bolster plate which surfaces the bed of the press is 15 in. thick and weighs 48,300 lb. Maximum die mounting surfaces are 96 x 96 in.—*The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio*



Hand-Operated Press Imparts 15-Ton Impact

Principle of the hand-operated Pioneer Ham-R-Press is transmission of hammer pressure through a vertical ram directly to the working point. The machine frame is made of strong nickel alloy, and the movable ram is precision piloted in the upper frame arm. Operation is simple. The punch is slipped on a tongue at the bottom of the ram. The die is then placed into an opening in the work table and locked by a setscrew. The material to be worked is placed over the die. Ram is lowered to the material, and the top of the ram is then struck with a hammer. Punching power is optional with the operator, but impact pressures as high as 15 tons are said to be easily attainable. A complete line of Pioneer Ham-R-Press punches, dies, and attachments are available. Punches for round holes range from ⅛ to 1½ in., and square and ovals from ⅜ to ⅞ in. Slotting, notching, riveting, marking and shearing, and staking tools are included in the line of hammer press attachments. Models are available in 5-, 7½-, 12- and 24-in. throat depths.

Pioneer Broach Co., 1425 So. Main St., Los Angeles 15, Calif.



WHY SPINDLE-SPECTION?

Sustained accuracy stems from the headstock spindle—the very heart of the lathe.

If it wasn't manufactured—and inspected—accurately, the lathe it goes into never will be a *precision* turning machine.

Monarch makes precision turning machines.

That's why we place such great stress on testing every Monarch spindle. The eleven elaborate tests we make are conducted in a separate department—we call it "Spindle-Spection".

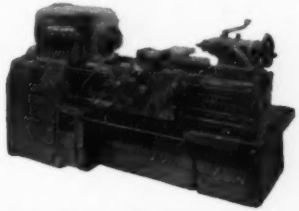
From your standpoint, it might well be called the "insurance department"—the place where one more clause is added to the invisible insurance policy that's built into every Monarch Lathe.

Other "clauses" include flame hardened bedways, induction hardened parts, helical gears in the headstock—and a host of others. Like to know more about these reasons why you'll get *peak production at a profit* with every Monarch Lathe? Ask for booklet 1112.

MONARCH'S
11 SPINDLE-SPECTION TEST TOLERANCES FOR SERIES 60 LATHES

Spindle Nose Size	.0005"
Spindle Nose Runout	.0001"
Spindle Nose Bearing	100%
Spindle Runout (14" out from nose)	.0003"
*Bore Size	.0005"
Bore Taper	.000"
Draw	.0003" to .0005"
Bearings Runout	.0001"
Gear Bearing Seat Runout	.0003"
Bearing Size	.0002"
Bearing Seat Size	.0005"

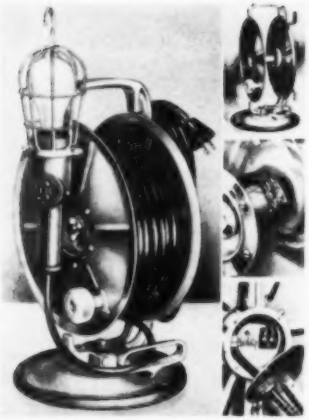
*This test, illustrated above, is accomplished with Sheffield Precisionaire gauges, set to two master ring gauges.



ACCURACY · ECONOMY · LONG LIFE
Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

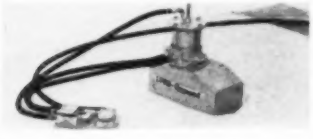
FOR A GOOD TURN *FASTER* — TURN TO MONARCH



Electric Cord Reel Short-Circuit Proof

The latest model of the Port-O-Reel weighs 9 lb without cord, stands 17⅜ in. high and is said to eliminate most of the wear ordinarily sustained on electric cords. The reel contact assembly, which enables cord to be used while the reel is turning, is coated with a special formula to prevent short circuits due to moisture. The reel will accommodate 150 ft of No. 16, 2-conductor cord or its equivalent in diameter, and greater lengths of cords for smaller diameters. Kink-and knot-free rewinding may be accomplished at a rate of about 10 ft per sec.

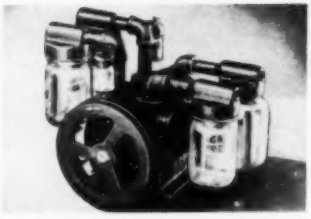
Industrial Electrical Works, Omaha, Nebr.



Hydraulic Pump Substitutes Air for Foot and Hand Power

Air operated hydraulic pump is primarily for LYON-Raymond equipment, but can be adapted to others. Substituting air power for foot or hand power, it can be used in place of the conventional electric motor-operated hydraulic pump. The pump is a single-acting air-operated unit and makes one stroke of its piston each time the pedal operated valve is open. The release is operated by another pedal. This pump is available with several styles and sizes of oil reservoirs.

LYON-Raymond Corp., 4752 Madison St., Greene, N.Y.

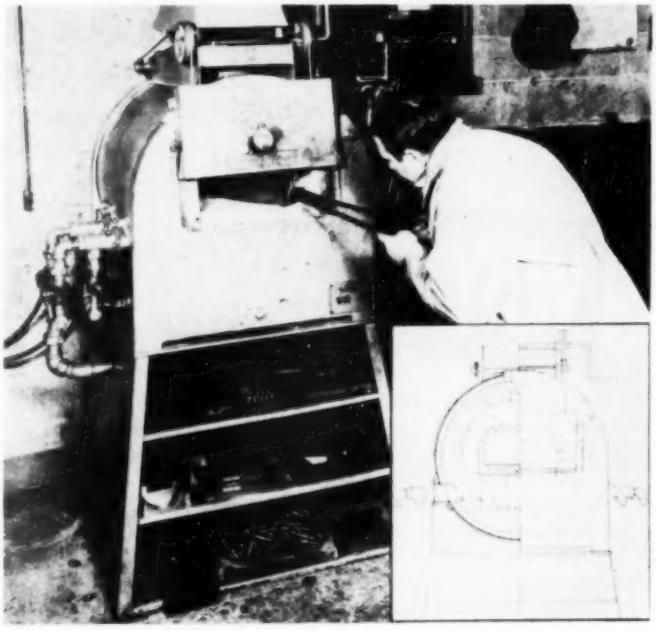


New Air Pumps Meet Punch Press Requirements

By producing a moderate vacuum and air pressure with comparatively large air volume per hp, these air pumps meet requirements for feeding paper, cardboard, light metal, or plastic materials on printing presses, folding and packaging machines, and punch presses. The units are of rotary-vane design.

Dual-chamber models deliver air pressure on one side and vacuum on the other. The small dual pump, Model 10x1040 delivers 9 cfm from each chamber at 1200 rpm. Either or both chambers produce vacuum to 20 in. or pressure to 20 psi. The large dual pump delivers 14 cfm from the pressure chamber, and 9 cfm from the vacuum chamber. Up to 15 psi pressure and 15 in. hg vacuum is delivered. The new model 3040 single-chamber pump produces moderate pressure or vacuum at 19 to 24 cfm, depending on rpm.

Gast Mfg. Corp., Benton Harbor, Mich.



Shop Furnace Convertible From Semi- to Full-Muffle

Inverted muffle section in the Sunbeam Stewart wide range oven makes the unit quickly convertible from semi-muffle to full-muffle for atmospheric hardening. Removable rear plug, where desired, permits center heating of long bars. Unit operates over a 300 to 2,400 F temperature range. Design and location of the combustion chamber and 95% turn-down ratio of the nozzle-mixing burners provide tremendous turbulence to the combustion gases making wide temperature range possible. Available heating space sizes are: 4 x 8 x 12 in; 6 x 12 x 18 in.; and 9 x 15 x 24 in. Furnace is adaptable to two-valve manual control or atmospheric temperature control employing air/gas proportioning valve.

Sunbeam Stewart Industrial Furnace Div., of Sunbeam Corp., 4433 Ogden Ave., Chicago 23, Ill.

ANOTHER 3M COMPANY SERVICE STORY

HEAVY GRAY IRON CASTING ready for "snagging"—on a belt backstand grinder at Nordberg Manufacturing Company, Milwaukee, Wisconsin.

FLASHING REMOVAL OPERATION—where Abrasive belts have produced smoother finishes—proved less tiring for machine operators.

New method of grinding gray iron castings removes metal 3 to 5 times faster

Nordberg Manufacturing Company speeds heavy stock removal with new 3M Method.

"Abrasive belts used for heavy metal grinding operations will remove metal three times faster than your present method", was the conclusion of a 3M Methods Report for Nordberg Manufacturing Company, Milwaukee. Based on this recommendation—this manufacturer of heavy power equipment converted to backstand belt grinding for removing gates and risers from heavy castings.

In actual production our recommendations proved up to *five* times faster on harder metals—and up to *nine* times faster than previous methods on softer metals. Hundreds of firms throughout the country have cut production costs and saved production time in grinding and finishing metals—often by a simple conversion of existing metal finishing equipment.

Why not send today—for your free copy of "STEP UP PRODUCTION". See how a wide variety of grinding and finishing operations can quickly and economically be accomplished with industry's versatile tool—3M Coated Abrasives.

Made in U.S.A. by MINNESOTA MINING & MFG. CO., *St. Paul 6, Minn.*

Also makers of "Scotch" pressure-sensitive tapes, "Underseal", "Scotchlite", "3M" Adhesives.

☐ Please send me a copy of your booklet "Step Up Production".
☐ Please send a 3M Methods Engineer to call on me. AM-1049

*Name*_____

*Firm*_____

*Title*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

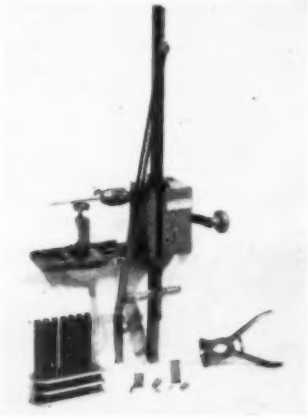
3M® ABRASIVE BELTS

General Export: DUREX ABRASIVES CORP., *New Rochelle, N. Y.* • *In Canada:* CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*

Throttle Valve Controls Falling Speed of Accumulator

As installed here the high pressure hydraulic throttle Protectomatic valve controls the falling speed of this weighted accumulator, preventing it from crashing on its bumper blocks. Designed to operate from 1500 to 5000 psi working pressure, the valve is machined from solid forged steel blocks, has bronze bushings, and stainless steel sliding plunger, seat, and spindle. Operation is automatic; the valve is controlled by a lever equipped with a roller which is actuated by the cam on the tank as it descends to within two feet of the bumper blocks. Movement of the lever lowers a plunger which builds up pressure retarding flow and consequently speed of descent.

R. D. Wood Co., Public Ledger Bldg., Philadelphia, Pa.



Spring-Coiling Machine Automatically Squares Ends

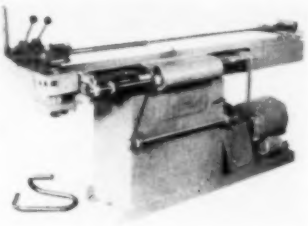
The Carlson No. 1 Spring Coiler is a semi-automatic machine for winding compression, extension, and torsion springs, both left- and right-hand. The end coils of compression springs are closed or squared automatically. This unit will handle wire up to 0.063 in. dia and will coil springs up to ¾ in. dia. Larger outside diameters are obtainable with special arbors. Springs up to 4 in. over-all length and up to 25 coils can be produced. The unit weighs approximately 25 lb.

The Carlson Co., 277 Broadway, New York 7, N.Y.

Wear-Resistant Tips Cap Worm Grinding Centers

Colmonoy wear-resistant tips can be silver soldered to the wear end of lathe or grinder centers which are worn back too far for further grinding. These tips are said to wear at least seven times longer in between grinding than high-speed steel. Tips are now available in their cast form, or already applied to standard size centers and finished ground.

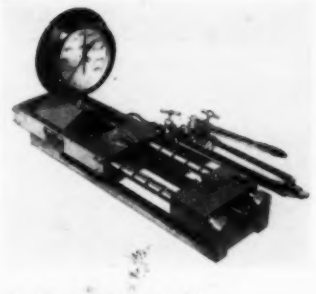
Diamonds and Tools, Inc., Div. of Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich.



Semi-Automatic Bender Handles 1-In. OD 16-Gage Steel Tubing

Capable of producing from 100 to 400 bends per hour, depending upon the size and length of material and number of bends to be made, the semi-automatic hydraulic Series 1400 bender has a maximum rated capacity of 1-in. OD 16 gage steel tubing with maximum bending radius of 8½ in. to center line of tube. The machine's movements are controlled by two toggle operated hand-clamping levers and one manual hydraulic-valve control lever. The hydraulic-operated bending arm moves at 29 rpm. The unit covers a 3x7 ft floor space.

Pines Engineering Co., Aurora, Ill.



Tensile-Testing Machine Makes Field Tests

The Model PO-40 portable tensile is partciularly adaptable for on-the-job testing of welds. The machine's capacity is 40,000 lb on specimens from 6 to 13 in. in length, up to ⅜ in. thickness and 2¼ in. width. High degree of accuracy makes this tester satisfactory for laboratory and shop testing as well. Operation is hydraulic, by means of a hand pump.

Steel City Testing Machine, Inc., Detroit, Mich.

Compact Switch Operated By Foot, Finger, Knee, Elbow

This tread-type switch is small, light, yet sensitive.

Mechanism can be operated by foot, finger, knee or elbow. The Linemaster compact switch is made of heavy-gage steel, has a black crackle finish, a cork composition, non-skid base, and weighs 6½ oz.

Simonds Machine Co. Inc., Southbridge, Mass.

Pencil-Size Microscope Magnifies Diameters 20X

No larger than an Eversharp pencil, this pocket-size microscope contains a four lens optical system which has magnification of 20 diameters. The body is aluminum, 5 in. long, and weighs less than 1 oz. The microscope is priced at $2.98.

DuMaurier Co., Elmira, N. Y.

FOR A *New Thrill* IN SHEARING . . .

Series No. 410 Shear for cutting steel plate up to 3/8" x 10'-0"

The electric foot switch is one of the many features that makes operation of Steelweld Shears easier and faster. It can be slid around the floor to wherever most convenient. Only a slight movement of the toe is required to operate it. This feature is standard on all Steelweld Shears, and is furnished at no extra cost.

TRY STEELWELD *Pivoted-Blade* SHEARS

REGARDLESS of what shears you have ever operated, in Steelweld Pivoted-Blade Shears a new thrill is in store for you.

Like a modern streamlined engine as compared to an old-time locomotive, or a luxury liner versus a tramp freighter, so will you find these new shears as compared to all power shears you have ever used before.

Here at last is something new in shearing history — a great advancement in design and performance — the only truly basic change for many decades.

Not only are these new shears easier to operate but their design assures smooth straight cuts to hair-line accuracy for years of operation. Their construction is extra heavy and all modern features are incorporated to provide for ease of operation, minimum maintenance and long life.

If you shear plate in any thickness to 1¼-inch or length to 18 feet, you should get the facts on these new Steelweld Shears. Send for catalog today.

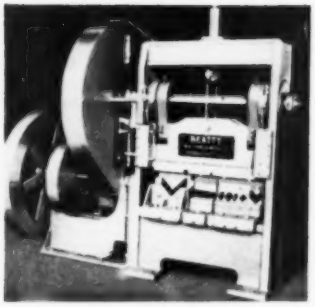
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1401 EAST 282nd ST. • WICKLIFFE, OHIO

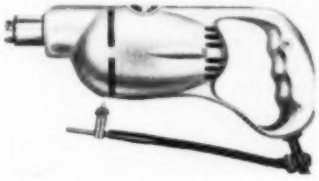
STEELWELD PIVOTED BLADE SHEARS



Hammond Shear Cuts Varying Shapes Without Tool Change

The Guillotine Bar Shear is designed for shearing of rounds, angles, bars, and squares without changing tools. It is suitable for either production or short order shearing, and provides a 48-in. base for mounting tools. This machine is available in capacities from 50 to 450 tons

Beatty Machine & Mfg. Co., Hammond, Ind.



Cummins Portable Unit Drills ¼-in. Metal

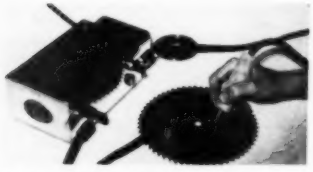
Operating on 115 volts ac or dc, streamlined ¼-in. General Utility Drills are available with Jacobs 1B Geared Chuck (Model 150), Jacobs Hex-Key Chuck (Model 160), or with Keyless Chuck (Model 170). Housed in die-cast aluminum the drills weigh 3 lb.

Cummins Portable Tools, 4740 N. Ravenswood Ave., Chicago 40, Ill.

Spatter-Proof Compound Is Rust-Preventive

Applied by brush, spray, or dipping, Protect-O-Metal No. 8 dries in less than an hour to a thin transparent coating said to prevent rust up to 6 months in the weather and two years on steel stored indoors. The coating also prevents adhesion of all flash and weld spatter during welding operations. It is delivered ready for use in one-gal and five-gal cans and 55-gal drums.

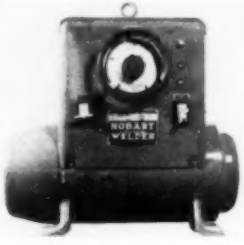
G. W. Smith & Sons, Inc., 5400 Kemp Road, Dayton 3, Ohio



Etchtool Ground Contact Equipped with Magnetic Unit

Size or shape of work present no problem for the Type SC-GA Luma magnetic ground contact for Etchtools because the unit is equipped with a strong long-lasting magnet which securely holds the ground contact to the work. Furnished as optional equipment with all new Etchtools, the ground contact comes in two sizes; 100 amp. capacity and 200 amp. capacity.

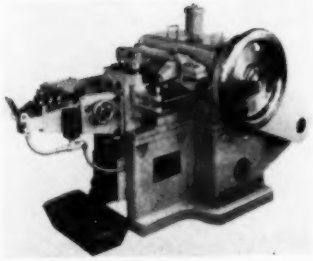
Luma Electric Equipment Co., Toledo 1, Ohio



Hobart Welder Has Multi-Range Generator

With five ranges of welding current and 100 steps of volt-ampere adjustment in each range, the "Bantam Champ" DC arc welder makes available 500 combinations of open-circuit voltage and welding current for selecting any desired arc characteristics. Model MZ-200-S, shown, is rated 200 amps at 30 volts on 50 % duty cycle. The current range is from 250 to 440 amps at an operating speed of 3450 rpm. It is 26-¼ in. long, 18 in. wide, and 25 in. high and weighs approximately 340 lb. Volt-ampere adjustment is built behind the main switch.

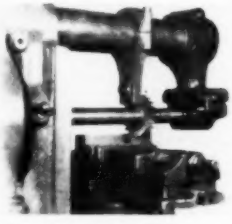
Hobart Bros. Co., Troy, Ohio



Black Model GB Machine Cuts Nails up to 3½ In.

Taking the place of Models GA and EA the Black Model GB wire nail-making machine is primarily intended for making all popular sizes of large-head roofing nails. It can handle all other styles of nails up to 3½ in. in length. Increase in the area that is pressure-oil lubricated is the principal change over the old machines.

Black Industries, 1400 E. 222nd St., Cleveland 17, Ohio.



Auxiliary Arbor Support Fits Round Overarm Millers

This arbor support can be attached close to the cutter without interfering with the operator and is adjustable for use on any diameter arbor. It is designed to fit practically all known models of milling machines having round overarms. The device prevents the arbor from springing and allows work to closer tolerances. The unit is priced at $24.95 retail.

The Federal Machine Tool Co., Emmett St., Bristol, Conn.

Feed Stop for Dies Installed in 15 Min.

The Dahlstrom Autostop is an adjustable automatic stock-feed stop which will work with blanking, progressive or compound dies. No slotting, milling or drill jig is necessary. All parts are hardened to resist wear.

Dahlstrom Mfg. Co., 2520 W. Larpenteur Ave., St. Paul, Minn.

Four typical machine shops report

"LONGER TOOL LIFE"
"BETTER FINISH"
"FASTER OPERATION"
} *WITH NEW*

J&L *FREE-CUTTING* "E"* *STEEL*

J&L STEEL

Four typical examples, taken from 100 case histories, show superior machinability of J&L "E" Steel.

For 4 years before "E" Steel was publicly announced, this new, free-cutting bessemer screw stock was tried by independent machine shops throughout the metal-working industry.

More than 6,100 tons were tested in over 100 applications!

Here are quotations from 4 typical case histories:

CASE HISTORY #1 ". . . tool life increased 100% at normal speeds . . . better finish . . . shop people liked it."

CASE HISTORY #2 ". . . tool life increased up to 200% . . . uniformity of finish remained constant . . . considerably increased speeds without sacrifice to finish."

CASE HISTORY #3 ". . . tool life increased two to four times . . . we were able to tap 1" full internal pipe thread, almost impossible on regular material."

CASE HISTORY #4 ". . . new steel machines very well . . . finish excellent . . . tool life increased . . . 5 to 10% better production."

You too can get greater economies in your machining operations with new J&L free-cutting "E" Steel. "E" Steel is available in three grades: E-15, E-23 and E-33, each within the composition limits of the standard bessemer screw steels and with similar tensile properties. All standard sizes and shapes are available. For further information write for your copy of our new booklet: "J&L 'E' Steel."

JONES & LAUGHLIN STEEL CORPORATION

* "E" STEEL IS QUALITY-CONTROLLED FROM OUR OWN MINES THROUGH THE FINISHED PRODUCT

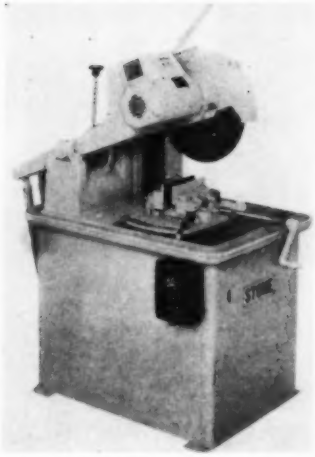
Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 19, Penna.

Please send me a copy of "J&L 'E' Steel."

Name_____

Company_____

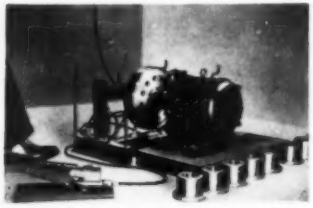
Address_____



Metal Cut-Off Machine Cuts 3-In. Solids, 44-In. Pipes

With capacity of 3-in. solids or 4-in. pipes in both ferrous and non-ferrous metal, the Stone "Swing-Cut" abrasive metal cut-off machine eliminates all belt drive with a 5 hp geared-in-head motor. A fast-acting self-centering vise, mounted on an adjustable swivel plate calibrated in degrees, provides for cutting at any desired angle up to 90°. Floor space required is 2½ ft by 4 ft, and the shipping weight of the unit is approximately 600 lb.

Stone Machinery Co., Inc., 333 Fayette St., Manlius, N.Y.



Hydraulic Dynamometer Raised to Connection Height with Jackscrews

Built with load capacities of 30 to 300 foot-pounds, Wagner hydraulic dynamometers are for testing large electric motors. Models are placed directly on the test floor and are raised to the correct height for connection to the motor to be tested, with jackscrews. Motors with shaft diameters up to and including 1 in. can be accommodated.

Tests that can be made with dynamometer include idle, pull-in, pull-up, full load, and locked.

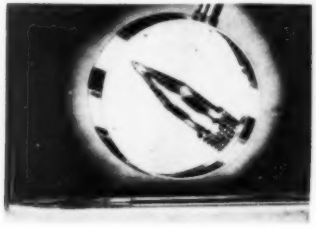
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.

Laminated Phenolic Punching Stock Available in Punched Parts

Rogers Corp. is supplying laminated phenolic punching stock in standard thicknesses as sheet or punched parts to meet NEMA specifications XP and XXP. Complete tool, die-making, and fabricating equipment is available.

Special formulations can be produced to meet special requirements including combining a melamine cover sheet with a basic phenolic stock.

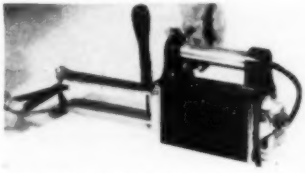
Rogers Corp., Manchester, Conn.



Tungsten Carbide Tip Brazed Into Scriber

With vertical and horizontal knurl providing an easy grip on the 5-in. shank, the Niagara tungsten carbide scriber cleanly marks tool bits, hardened steel, chromium, stone, and glass. It is said to be useful on rusty repair work and cleanly penetrates hard scale on boiler plate. Called the Nico Scriber this tool will retail for approximately $1.

Niagara Instrument Corp., 58 Market St., Lockport, N. Y.



Portable Spot Welder Weighs 14½ Lb

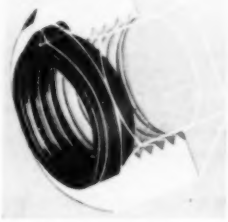
Designed to be brought right to the job the Welderon can be plugged into any 115 volt, 60 cycle, 25 amp. current output. Overall length is 17¼ in.; width, 3 in.; height 8½ in.; and depth of throat 7¼ in. The unit is fitted with three current tops for spot-welding metals up to a combined thickness of ⅛ in. The Welderon is priced at $78.50 east of the Mississippi.

The Welderon Co., 703 Industrial Trust Bldg., Providence 3, R. I.

Portable Pallet Crane Combines Flexibility, Lifting Capacity

Available with either manual or motorized hydraulic lift, the Grand Portable Pallet Crane No. 40-PC can raise 16- x 24-in. pallets with up to 500 lb. loads to a maximum height of 5 ft 6 in. It can be stopped at any intermediate height. Cranes up to 6,000 lb. capacity can be furnished.

Grand Specialties Co., 5135 W. Grand Ave., Chicago 22, Ill.

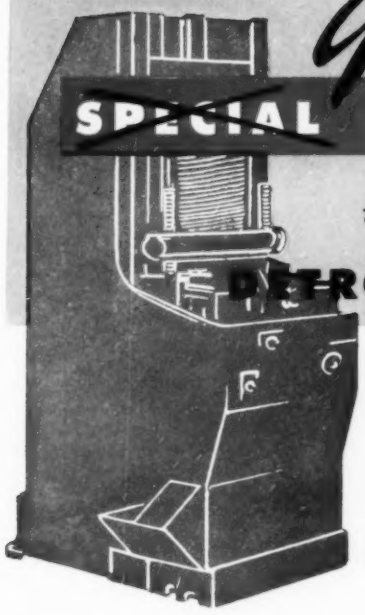


Locknut Can Be Applied In Either Direction

Consisting of a standard steel nut in a slightly elliptical retainer ring, this Security locknut locks in any position on the threaded part. When the locknut is applied the bolt forces the elliptical heat-treated alloy steel retainer back into circular shape, causing it to grip the bolt threads, preventing rotation of the nut even under conditions of severe vibration.

The nut can be applied in either direction. When the retainer grips the bolt on which the nut is applied, bolt load or stress is borne entirely by the nut. The nuts are made with National coarse and National fine threads in standard sizes from ⅜ to 2½ in.

Security Lock Nut Corp., 1815 North Long Ave., Chicago 39, Ill.



General SPECIAL PURPOSE MACHINE through DETROIT BROACH TOOLING

THE SPEED, ACCURACY AND EFFICIENCY OF BROACHING CAN BE APPLIED TO MANY *GENERAL PURPOSE JOBS* IN *Your shop*

The slab broaching set-up at the left is one in use in Detroit Broach's own shop. As shown in this illustration, it is used to face the ends of broaching tool blanks of widely different thicknesses, widths, and lengths. It is many times faster than any other method, guarantees squareness of the ends and produces a fine, smooth finish.

This illustrates how universal-type tooling can make it possible to apply broaching economies on parts that are not mass produced. Detroit Broach has engineered and built tooling for many manufacturers who broach a number of similar parts with one set of tools. Also, it is quite often possible to increase the work load of present broaching equipment through the redesign of tooling on this principle.

Because they specialize in the design and manufacture of broaches and broach tooling exclusively, our engineers are thoroughly schooled in all types of broaching on all types of broaching machines. In addition, this broad experience serves as a valuable balance for ingenuity and imagination when solving new broach problems.

Detroit Broach application engineers will gladly study your present and proposed broaching applications and make their recommendations. To justify these recommendations, they are accompanied by actual cost and production data. Why not write today for one of our engineers to call at your plant?

DETROIT *Broach* COMPANY

20201 SHERWOOD AVE. DETROIT 12, MICH.

*LOOK for

big reductions in costs where opportunities for substantial

SAVINGS

are greatest . . . in the incredibly rich field of materials handling.

For the quick, sure way to achieve them,

*LOOK to the fast, sturdy, low-cost machines produced by

CLARK

How several foremost industries have "looked to Clark" —with quick and substantial profit to themselves— is described and illustrated in Material Handling News and in Clark's exceedingly helpful motion pictures. You can enjoy the benefits of these by requesting them on your business letterhead.

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

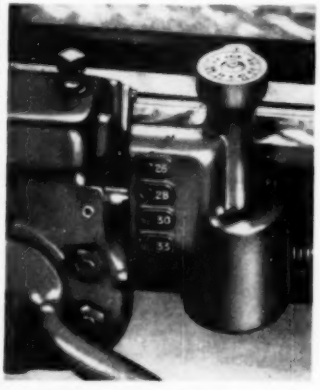
INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 3, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

THE NATIONAL GUARD DEFENDS AMERICA — JOIN NOW

Safety Spectacles Sport One-Piece Lens

Made from "Optilite," a new optical safety plastic, the one-piece lens of the "Saf-I-Spec" can be replaced or adjusted instantly. Detachable temples clamp to the outer edge of the lens making it possible for the wearer to adjust them for a correct fit. This safety spec can also be adjusted to wear over personal glasses. Equipped with an integral molded sweat-bar the lens are available in crystal clear or anti-glare green.

United States Safety Service Co., Kansas City 6, Mo.



Metric Thread Dial Indicator Speeds Leadscrew Cutting

The South Bend Metric Thread Dial Indicator is to aid in cutting screw threads on lathes equipped with metric leadscrews. Instead of reversing the lathe to return the cutting tool to the starting point, half nuts may be opened and the carriage moved by hand. The graduated dial shows when to engage the half nuts so the cutting tool will follow the original cut. To provide for varying pitches of metric screw threads, dif-

"We get 20% longer tool life, better finish on B-1112 steel parts with

GULF STAINLESS CUTTING OIL

says this Foreman

Machine shop Foreman (left) consults with a Gulf Lubrication Engineer on the performance of Gulf Stainless Cutting Oil.

"Gulf Stainless Cutting Oil delivers 20% longer tool life than any of the five or six competitive oils we tested for this job," says this Foreman. "At the same time, we get smoother finishes with Stainless and fewer rejects."

This is one of scores of shops that have improved production and tool life through the use of Gulf Stainless Cutting Oil on certain types of jobs. In addition to its outstanding performance as a cutting fluid, Gulf Stainless Cutting Oil also provides adequate lubrication for the working parts of machine tools. Thus it is ideal for machines using one oil as both lubricant and cutting fluid. Another important advantage: it is noncorrosive to finished metal surfaces.

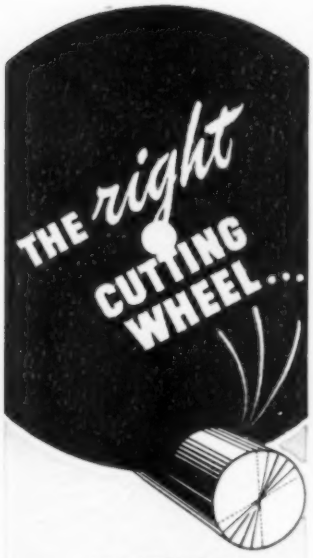
Ask a Gulf Lubrication Engineer to demonstrate the advantages of Gulf Stainless Cutting Oil and other quality cutting oils from the complete Gulf line in your shop. Write, wire, or phone your nearest Gulf office today.

Gulf Oil Corporation • Gulf Refining Company

Division Sales Offices:

Boston • New York • Philadelphia • Pittsburgh • Atlanta • New Orleans • Houston • Louisville • Toledo

GULF INDUSTRIAL LUBRICATION



IS THE KEY
TO
CUTTING
COSTS

CALL AN *Allison*
ABRASIVE
CUTTING
EXPERT

THE ALLISON COMPANY
257 Island Brook Avenue
Bridgeport 8, Connecticut

Allison
abrasive
CUTTING
WHEELS

7AL49

ferent-sized gears are mounted on the lower end of the thread dial shaft. This equipment is now available for 9-in. swing South Bend Lathes.

South Bend Lathe Works, 378 E. Madison St., South Bend 22, Ind.

Adjustable Speed Drive Gives Finger Trip Motor Control

Employing electronic precision to provide a wide, stepless, range of speed control for dc motors from ac sources, the Westinghouse Mot-O-Trol packaged adjustable speed drive starts motors, brings them up to preset speeds, permits change of speed at any time, applies dynamic breaking for stopping, and reverses motors. A single dial gives fingertip control of the motor throughout its entire speed range.

Complete sub-assemblies can be removed for easy maintenance. The frictional horsepower unit operates on 110/220 volts, 50/60 cycle, single phase.

Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa.

Solenoid Valve Operates Up to 300 Cycles Per Min.

The Series M-3, three-way bronze-body solenoid valves are designed for use with petroleum oils, kerosene, gasoline, water, air, and inert gases with operating pressures from 20 to 150 psi. Normally-opened, normally closed and directional-flow

COVEL
UNIVERSAL
Cutter and Tool Grinders

No. 22

No. 12

COVEL will help you cut down the high cost of cutter and tool replacement. When sharpened on a COVEL, tools go back to work with cutting edges perfectly ground — last much longer between grinds. COVEL has helped scores of plants in solving their tool and cutter problems. Special attachments adapt these grinders to a wide variety of jobs — including internal and external grinding.

For Carbide Tools

COVEL builds a special head for grinding Carbide Tools. Rough and finish wheels may be mounted at opposite ends of the Reversible Rotation Spindle. The head swivels 180° to place either wheel in working position, permitting both rough and finished grinding without disturbing work set-up. This head is optional equipment with the 12 and 22.

Send for free illustrated Bulletin A-109 today.

COVEL
MFG. COMPANY
Our 75th Year
BENTON HARBOR, MICHIGAN

Steel-Weld FABRICATION

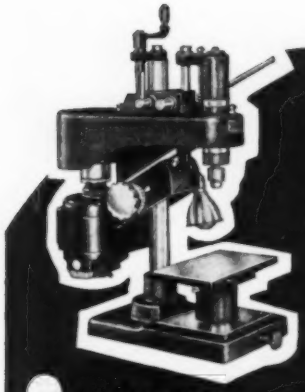
More and more machinery parts and assemblies are being produced in welded steel form. This diesel engine base is typical. In your manufacturing activities, need will arise for a good source for Steel-Weld Fabricated parts. The Mahon organization invites your inspection of its complete facilities for Steel-Weld design engineering, production, and rough or finished machining. A source ready to serve you well, regardless of what your requirements may be . . . a source from which you may expect a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY

Detroit 11, Michigan

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON



SMALL HOLE

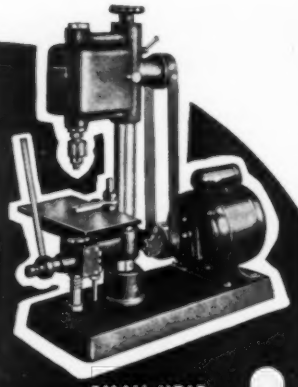
PRECISION DRILL

SUPER-SENSITIVE
VARIABLE-SPEED

The Hamilton Varimatic Drill has stamina. All of the stamina needed for hard, continuous production work. But it is also a tool of precision; built to extra close tolerances for the drilling of small, precision holes (.004" to 5/16") in materials as diverse as paper and monel or ceramic and bronze.

Speed is infinitely variable between 840 R.P.M. and 9300 R.P.M. Clearance from center of chuck to column is 5", from table to chuck, 9½".

Our bulletins V-47 and T-47 illustrate and explain these two precision machines in detail. Write for them!



SMALL HOLE

PRECISION TAPPER

COMPANION TOOL
TO THE VARIMATIC DRILL

SUPER-SENSITIVE

The spindle of the Hamilton Super-Sensitive Tapper idles in reverse, and thus may be centered without cutting. When pressure is applied to tap, direction of rotation changes and tapping begins. Release of pressure again reverses rotation and reduces speed to "idle" instantly and automatically, withdrawing tap from hole.

This feature, and the tapper's adjustable stops, make possible the tapping of blind holes to the very bottom without danger of tap breakage and in a minimum of time.

Capacity of the Hamilton Tapper is from the smallest and finest tap to 10-32 inclusive. Spindle speeds range from 1200 R.P.M. to 2600 R.P.M. Clearances; center of chuck to column, 3¼", and from table to chuck, 3¾".

THE Hamilton TOOL COMPANY

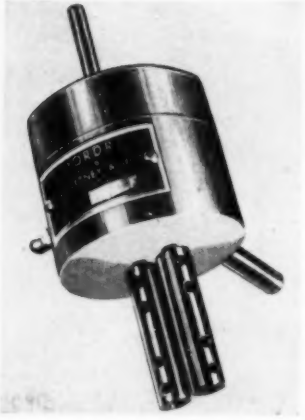
SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTALVATORS

830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

control types are available with full ⅜-in. orifice and ⅜- or ½-in. N.P.T. ports. These valves have been operated up to 300 cycles per min. on air.

All internal metal parts are brass or stainless steel. A spring-loaded pilot insures positive closing with the valve mounted in any position. The diaphragm is made of tough-coated nylon fabric. Valves are 5½ in. high x 2-5/16 in. x 3-3/16 in. and weigh approximately 3¾ lb. Maximum power consumption is 10 watts.

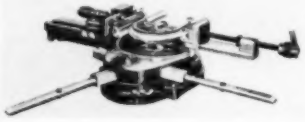
Skinner Electric Valve Div. of the Skinner Chuck Co., Norwalk, Conn.



Drill Unit Designed For Close Center Work

The Taperdril is a high-speed driving unit for drilling or tapping two or more holes on close center work. Installed in a drill chuck or tapping attachment, it can be used for drilling, reaming, tapping, or countersinking. Sizes are available from ⅜- to ½-in. centers for Model F (shown) and ⅜ to ¾ in. for Model R. Model R uses no idle gears, and runs in reverse.

L. E. Ottney & Co., 3650 W. Eleven Mile Rd., Box 469, Royal Oak, Mich.



Parker Hand Bender Handles 3 In. Tubing

For general utility bending of tubing up to 3-in. dia, the Model 848 tube bender accommodates thin or heavy wall copper and aluminum alloy tub-

Hy-Draulic

Rockford Hy-Draulic Duplicators can be set up these four different ways.

Here's how you can do it

When parts have shapes that standard machines can't produce economically . . . a Rockford Hy-Draulic Duplicator is often the answer. When you equip a Rockford Hy-Draulic 36" Openside Shaper, Planer or Shaper-Planer with a Rockford Hy-Draulic Duplicator such work as machining die or mold contours or producing parts like impeller blades becomes easier to do . . . with accuracy and considerably lower cost.

Many jobs that once required a lot of hand work and time are now fully machine-finished with speed and accuracy by means of a Rockford Hy-Draulic Duplicating attachment. Imagine the time and money saved by the A. O. Smith Corporation in the operation illustrated above . . . the planing of a convex surface on a pipe drawing die.

If you now have work that costs too much to produce, investigate the production possibilities of the Rockford Hy-Draulic Duplicator. Your inquiry is invited.

ROCKFORD MACHINE TOOL CO. • Rockford, Illinois

ROCKFORD Hy-Draulic SHAPERS • PLANERS • SLOTTERS • SHAPER-PLANERS

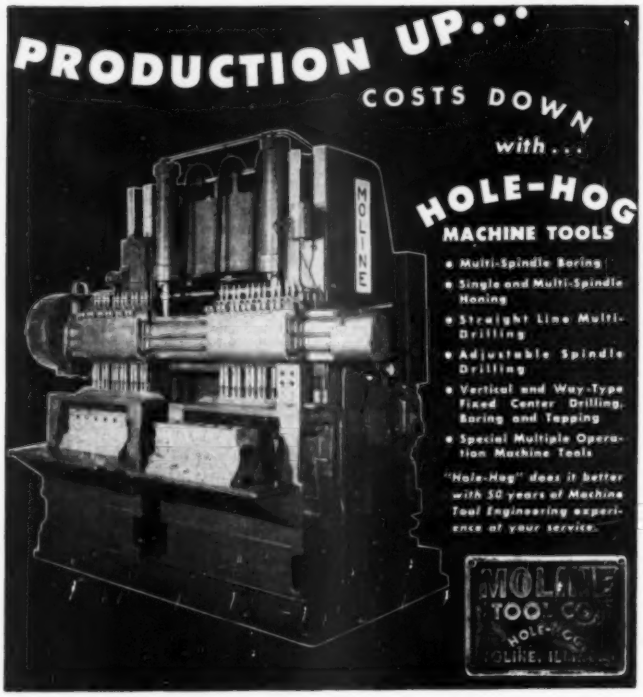
1. with stationary template mounted on the rail

2. with traveling template mounted on planer table or shaper ram

3. with stationary template and generating table fixture

4. with traveling template and generating fixture

CONTOUR WORK MACHINED WITH EASE • ACCURACY • SPEED



Make our plant your gear department—
Heavy pitch gears for construction equipment.
You can very frequently obtain quality gears and gear assemblies at a saving over present cost.
Our facilities include the most modern gear cutting machines of all types and many specialized machines arranged in batteries for volume precision production.
Expert engineering service is available to our customers for planning production on an efficient and economical basis. Write for a copy of Amgears Case Histories that illustrate the value of our engineering service.
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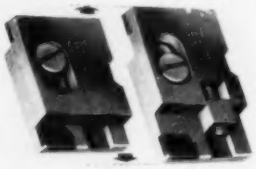
Detroit • Cleveland • Chicago

ing, and light- or medium-gage annealed steel tube. It is operated by levers actuating a central spindle and the attached radius block through gearing. Ratios of 30-1 or 8-1 may be chosen.

Bends up to 180° may be made ranging in radius from 1¼ in. to 12 in. Radius blocks, clamp blocks, slide blocks and mandrels are available for all standard sizes of tubing.

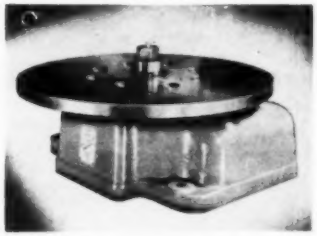
The Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio



Expansion Blade Is Carbide Tipped

This carbide-tipped adjustable expansion blade, manufactured by Super Tool Co., is for standard reamers and boring bars. A wide range of standard sizes up to 4 in. are available for "off the shelf" delivery.

Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.



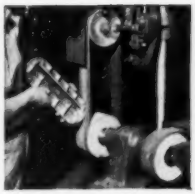
High Speed Indexing Fixture Is Electrically Controlled

Table indexing motions of the Ettco-Emrick No. 97 electric indexing fixture are controlled electrically through a modified Geneva system. At each indexing station, the table is locked in place by a hardened locating pin. This unit can be used for punch press, tapping machine, drill press, and similar operations.

A built-in electric control automatically synchronizes the movement of the spindle and the table, and also controls the downward motion of the spindle. Interchangeable indexing plates range from 10 to 14 in. dia are available.

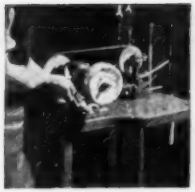
Ettco Tool Co. Inc., 594 Johnson Ave., Brooklyn 6, N. Y.

Dust chutes cause no interference with large pieces.

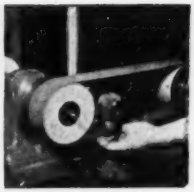


Guard raises, or swings clear, to expose any part of belt.

Platen in up-position provides flat working surface.



Easily made into a buffing machine, for many jobs.



With platen down, pieces are worked from under belt.

new!

Low cost! Portable! Takes little floor space! Does many metal-removing operations formerly requiring heavy, expensive machines!

DELTA® *Belt* Grinding, Polishing, and Deburring Machine

Can be used to do all this—and more!

• Clean out slots • Remove flash in corners • Remove fins • Smooth up crowns • Remove nibs • Remove parting lines • Chamfer corners

$130.75

without adjustable guards, dust chutes, motor, switch, or switch rod.

Price subject to change without notice.

Available in models to suit varying needs See Bulletin AD369

DELTA MILWAUKEE®

You speed up flashing, grinding, cleaning, and polishing, with this new Delta *Belt* Grinding, Polishing, and Deburring Machine. You save time, labor, and material.

In this condensed unit on a welded steel stand, you get a production machine at low initial cost. With accessories to meet your particular requirements, it does hundreds of different jobs.

There are no set-up wheels to bother with; no grinding wheels to dress. Instead, you use coated abrasive belts that are inexpensive, long-wearing, quick and easy to replace.

The Delta *Belt* Grinding, Polishing, and Deburring Machine is carefully engineered for long, trouble-free service. Delta quality features assure you of that: Preloaded, lubricated-for-life ball bearings. Precision-bored bearing seats. Dynamically-balanced pulleys. All-around rugged construction. Delta Dust Collector available for use with this unit protects workers' health and expensive machinery.

Make metal-removing fast and economical. Put Delta *Belt* Grinding, Polishing, and Deburring Machines to work for you on your production line—and in your inspection department, to clean up imperfections on the spot.

Have your nearby Delta distributor show you this new machine. Send coupon for free Bulletin AD369.

Ask your distributor about easy time-payment plan!

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

POWER TOOL DIVISION
ROCKWELL MANUFACTURING CO.
MILWAUKEE 1, WISCONSIN

TEAR OUT COUPON AND MAIL TODAY!

Power Tool Division
ROCKWELL MANUFACTURING CO.
608L E. Vienna Ave., Milwaukee 1, Wis.

Send me free copy of Bulletin AD369.

Name.....

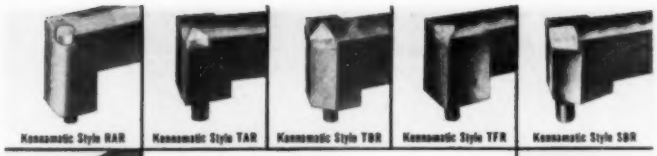
Title.....

Company.....

Address.....

City.....(.....) State.....

WM-25



Here They Are

KENNAMETAL Developments in Mechanically-Held Tooling for *Better* Production at *Less* Cost

Kennametal mechanically-held tools are outstanding in their performance, and in the savings they effect, because:

THEY ELIMINATE THERMAL STRAINS

The inherent strength of Kennametal is more fully utilized. Harder grades can be used on heavy jobs at coarser feeds.

THEY SIMPLIFY TOOL SETTING

Tips can be repositioned, or replaced, without disturbing the tool holder.

THEY REDUCE GRINDING COSTS

Procedure is simpler and less frequently required. No steel needs to be ground – only the carbide. Indexing feature of Kennamatic and Kendex tools provides multiple cutting edges between regrinds.

THEY LOWER INVENTORY

Fewer tools are required to float a specific job, and only tips or inserts need to be stocked.

THEY INCREASE MACHINE PRODUCTIVITY

Down time is minimized because fewer tool changes and adjustments are required.

Our field representatives are fully equipped to help you apply this advanced tooling technique for better production at less cost. Ask them to demonstrate.

The tools illustrated are made in both hands, in various sizes, with Kennametal tips suitable for machining steel, cast iron, and non-ferrous alloys.

Does Kennametal Inc. Manufacture Brazed Tools, and Blanks?

Yes—Kennametal Inc. produces and sells directly to the user a greater number of different carbide tools of both brazed and mechanically-held types than any other manufacturer.

Send for Catalog 49

It shows the most complete and diversified line of carbide tools ever offered.

KENNAMETAL Inc.
SUPERIOR CEMENTED CARBIDES
LATROBE, PA., U.S.A.

ROUND TABLE Discussion

CLIQUE OR CLICK?

The afternoon was sweltering hot and Ed weary and somewhat worried with the problems of the past week, was sitting outside in his favorite deck chair. The hot sunshine soon sent him nodding and, ere long, he fell asleep; and, sleeping, methinks, he must have dreamed. He had been ruminating over some of his shop problems, and had felt that some of these were getting beyond him. With men of the Ed type, sensitive and fearful, there is always a tendency to exaggerate, whether for good or ill, and some of his problems, in his dream, began to assume huge and terrifying proportions. He had been persuaded into giving his wife's sister's husband's brother a job and he became conscious of the dire position he could be in at home, as well as in the shop, if he felt it necessary to complain of his work or conduct. And then he had two brothers working for him; quite decent chaps and good workmen; a shop full of such men would be fine but what if they began to plot. They might be at it now, because they are asking for a job for a younger brother; and who knows there might be another four of them. What's behind it; there is something; it's a plot right enough; they are combining; it's a clique to coerce me; why they might even put me across their knee and spank me; oh the shame of it would be terrible; I don't like the look of it at all and, like Alice in Wonderland, he felt himself getting smaller and smaller; everything seemed to get faint and dark and red-bloody; Oh, I can't fight 'em all (or at all) help! help! murder.

The sound of his own voice seemed to awaken him; he opened his eyes; stretched himself and said "I must have been asleep and had a dream; oh, but it did seem real and I felt sure those Williams boys were out for trouble; I must be a fool, seeing bogeys and putting up skittles just to knock 'em down. I'll give the young Williams a job, aye and welcome another one; I've been frightening myself for nothing at all; Al's outlook is the right one; I won't think in the red again; and, oh, dang it all, I've got my dark red specs on now, no wondering vision is distorted. Point of view; wrong think-

POP'S school of Filing

WHY YOU--
*!!??★!
WHAT TH—
-?☆!!
D—!!
POP SENT "DAFFY" DILLY TO THE TOOL ROOM FOR A SUPER-SHEAR-- LOOK WHAT HE BRUNG!
YESTIDDY HE WAS GONE AN HOUR HUNTIN' A LEFT-HANDED MONKEY-WRENCH!
BET THE LI'L SUCKER WAS WEANED ON A PICKLE-- A DILLY! GET IT?

Daffy's error may be excusable, because to many shop workers, foremen, production and purchasing heads the patented Nicholson Super-Shear* File is still "news"—even though it already has had several years of popular usage in various industries.

*Reg. U. S. Pat. Off.

The Super-Shear is a rather remarkable and versatile file—different from the standard curved-tooth file in that—

(a) Its teeth are in an "off-center" arc that varies their angles and spacing to provide both fast cutting and smooth finishing *in one operation;*

(b) The "rake" of its *milled,* "razor-sharp" teeth is at an angle that produces virtually a "shaving" or shearing action;

(c) Its longitudinal serrations help to break up the chips ("shavings") for sliding them out along the gullets without clogging.

Put the Super-Shear to work on aluminum, brass, bronze, babbitt, magnesium, plastics, cast iron, cold-rolled steel—or even annealed tool and die steels—and note the results. Fast? Very! Finish? Smooth as a jack plane's finish on wood! Production costs? Definitely lower on the kind of filing jobs it's made for. Try a batch. Consult your industrial distributor.

• • •

NEW EDITION OF "FILE FILOSOPHY," ***on kinds, use and care of files, available to industrial executives, purchasing and production heads, key mechanics. Send for it. FREE.***

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(In Canada, Port Hope, Ont.)

NICHOLSON FILES ***FOR EVERY PURPOSE***

In less than 5 months

PAID for ITSELF

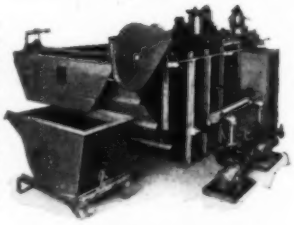
The Actual Savings Record of One Plant Using HOFFMAN Flotation Equipment

Based on One Year's Operation of 7 Centerless Grinders

	BEFORE	AFTER	SAVINGS
Total Shifts Operating	2860 hrs.	2860 hrs.	
Total Wheel Dressing	2860 hrs.	1450 hrs	
Labor for Dressing	$3,646.50	$1,823.25	$1,823.25
Time for Cleaning Coolant Tanks	954 hrs.	NONE	
Labor for Cleaning Coolant Tanks	$1,216.35	NONE	$1,216.35
Grinding Wheels (est.)	$1,556.00	$1,356.00 (est.)	$200.00
Diamonds (est.)	$1,100.00	$900.00 (est.)	$200.00
Soluble Oil	$915.00	$715.00 (est.)	$200.00
MAINTENANCE SAVINGS (Annual)			$3,639.60
PRODUCTION SAVINGS Based on 3,814 hours saved, evaluated at $5.00 per hr. per machine			$19,070.00
TOTAL SAVINGS			$22,709.60
INSTALLED COST of Hoffman Flotation Unit			$9,488.60

Get the Figures for *Your* Operations

Detailed cost records kept by one manufacturer revealed these phenomenal savings with a Hoffman central system for coolant clarification. Along with better quality and faster grinding, this plant saved production labor formerly wasted on cleaning individual sumps. A Hoffman flotation unit provided automatic clarification with the amazing economies shown above. These same cost-cutting economies can be obtained in your plant. Write *today* for literature and a FREE Hoffman filtration engineering survey.



Models from 20 to 1,000 g.p.m.
Larger capacities to your specifications

FILTRATION DIVISION

U.S. HOFFMAN MACHINERY CORPORATION

211 LAMSON STREET, SYRACUSE 6, N. Y.

CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET ONT.

ing, lack of courage or control. Did Edison or Ford think like this? But then Ed is not, never will be either one or the other.

P. E. James
Lincoln, England

•

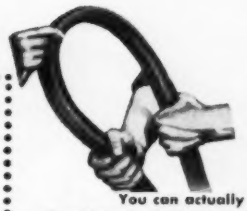
PASSING THE HAT

The fairest and least troublesome way in which to assist people who are "under the weather" is by means of a fund to which all concerned contribute an agreed sum each week. Most large companies in this country (Scotland) have a welfare sickness and benevolent fund and in some cases, willingness to become a subscriber to the fund is a condition of employment. A membership card is issued to each subscriber, in booklet form, setting forth the constitution and rules, so that each member is made clearly aware of what he can expect in the matter of benefits and what is expected of him. Such schemes do much good work and in large concerns the running expenses are borne by the company. Surplus, if any, is devoted to providing amenities and sports facilities for the workers.

In small and medium-size works over here, official Welfare schemes are not so much in evidence but a Sick Club, run on voluntary lines by the workers themselves, is very successful and deservedly popular. Since it is purely a "help out" measure in times of sickness, the individual contribution is low and membership is voluntary, though few of the workers are out of the scheme.

The weekly contribution per member is one shilling. Benefits paid are: Sixteen shillings per week for the first thirteen weeks' absence; ten shillings per week for the next thirteen weeks; seven shillings per week for the remainder of the year, if necessary.

The scheme is administered by a secretary, treasurer, sick steward and a committee of four. The secretary and treasurer each receive sixpence for every new member joined up and that, with occasional postage, comprises the entire running expenses. A committee meeting is held once per month to transact any competent business and to hear a report from the sick steward as to the progress of those who are in receipt of benefit. The sick steward is also a member of committee. Each member of committee takes a turn as sick steward and since there are five of them, each acts as steward for approximately ten weeks per year. Each week, the sick steward delivers the benefit in person and is thus in a



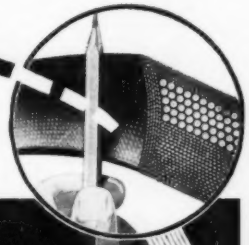
You can actually *feel* the sides of a belt *change shape* as the belt bends.

In Two Minutes You Can See Exactly How...

The Concave Side

(U.S. Patent No. 1813698)

SAVES Your Transmission DOLLARS



Take *any* V-belt in your hands and bend it as it bends in going around a pulley. You will see that the top of the belt, being under *tension*, grows *narrower*. The body, under compression, *widens*. The sides *bulge out*.

This shape change—in a *straight-sided* V-belt—is shown in Figures 1 and 1-A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Now look at Figures 2 and 2-A. There you see how the *same shape change* affects the V-belt built with the precisely engineered *Concave Side* (U.S. Patent No. 1813698).

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave Groove.

The top of the belt narrows, the body widens. But the sides *merely straighten—and* the new shape *exactly fits* the sheave groove!

Two savings result. (1) Uniform side-wall wear—*longer life!* (2) Full side-wall grip on the pulley carries heavier loads and *sudden load increases* without slipping; saves belts, saves *power!*

The Mark of SPECIALIZED Research

The Concave Side is *MORE IMPORTANT NOW Than Ever Before*

Because the sides of a V-Belt are what actually drive the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

4910

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY

DENVER, U.S.A.

The World's Largest Makers of V-Belts

HY-PRO licked the problem and increased production *10-fold!*

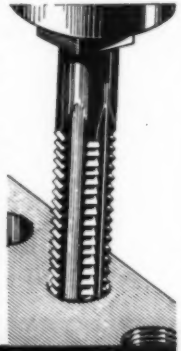
PARTS: Anchor pieces of 1020 steel with *punched holes.*
PROBLEM: Tapping with ordinary taps had to be done at very low speeds to prevent welding tap to piece. Changing cutting oil made no difference. Taps were continually galling in the soft, stringy material.

Then they called the HY-PRO Sales Engineer.

HY-PRO SOLUTION: He recommended a Hy-Pro ⅜–24 3 Flute Spiral Point Tap with the exclusive Hy-Pro Ferrox Surface Finish. Running at a speed of 50′/min. with a water-soluble lubricant, production increased tenfold. The Hy-Pro Taps never galled in the soft, stringy steel and stayed sharp longer in spite of the work-hardened, punched holes.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.



Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

position to report the circumstances to the committee. This personal touch gives pleasure to sick workmates besides keeping the others informed as to his progress. It is also a check on possible head slinging. An account is opened in a savings bank and the treasurer lodges all cash there, the yearly bank interest on the sums lodged is divided between the secretary and treasurer as part recompense for their extra work in connection with the scheme.

At the end of each year the surplus is shared out, equally, among the members, and the astonishing thing is that they normally receive back 60% of their contributions. The amount of sickness determines, of course, the value of the end of the year share out, but the total yearly expenses, operational and benefits paid out, has been as low as threepence per member per week. At the beginning of the New Year, re-enrollment takes place, when the secretary and treasurer get sixpence per head for every member enrolled.

In some works the secretary and treasurer run a holiday fund, into which the men put, each week, what they wish to save. This is a side line and a separate account is opened for the purpose. This fund is disbursed at mid-summer and New Year holiday periods, the secretary and treasurer taking the bank interest for their trouble.

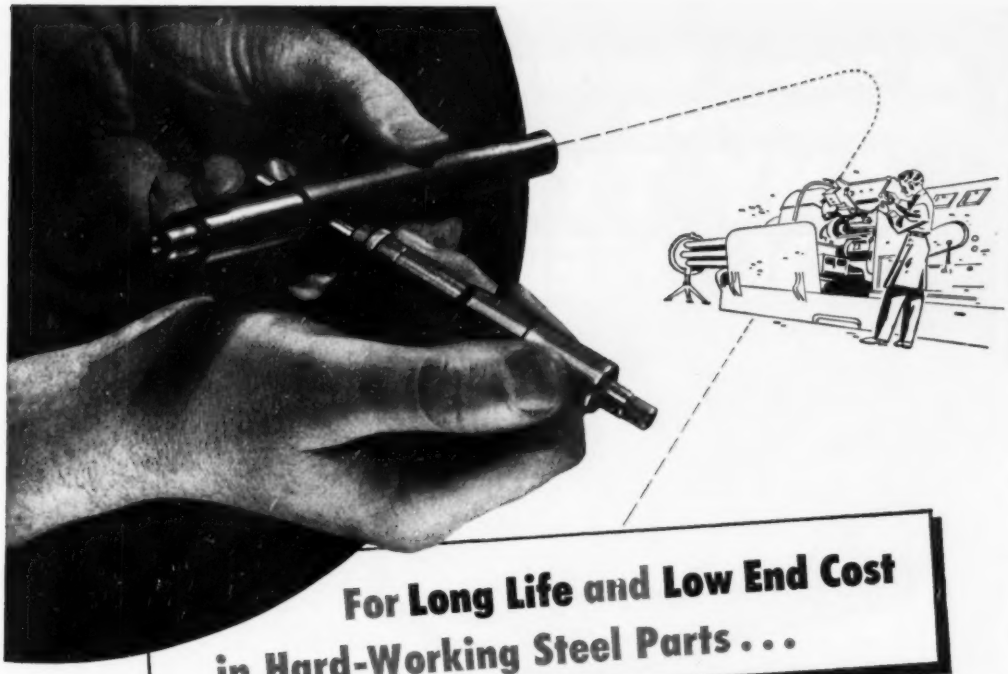
C. D. Mackinnon
Lanarkshire, Scotland

•

THE ITCH TO TRAVEL

We must have consideration and be thoughtful of the employee who resigns his job to gain more experience, more money or for a better opportunity At sometime or other in our lives we all get itchy feet and desire a change. We have two employees who work in our department who resigned their jobs and were later rehired. Both these men are good workmen and have helped us with their varied experience elsewhere.

In this particular case, this man had only quit the one time and could not be classed as a rolling stone. We as foremen or leaders can do much in the proper placement of personnel according to their capabilities to keep our employees happy with their present surroundings. It is, however, well to remember we can not force a man to do anything, but a good man can be led. We must remember that we can not always think in terms of what's good for us, we must also have the desire to consider what is good for the employee and have the ability to see the em-



For Long Life and Low End Cost in Hard-Working Steel Parts . . .

. . . use *Republic* Cold Drawn Alloy Steel Bars

LONG LIFE—Because Republic Alloy Steels provide these long-proved advantages: (1) High strength to carry heavy loads; (2) Toughness to withstand severe shock and strain; (3) Uniform response to hardening treatment that produces hard bearing areas.

LOW END COST—(1) Because the long life of steel parts made of Republic Alloy Steels means fewer repairs and replacements—less maintenance expense—more operating time and less down-time. (2) Because these bars provide the UNIFORM MACHINABILITY, accuracy of section, close tolerances and fine surface finish for which Union Cold Drawn Products are so well known—and which means lowest possible parts production costs.

Republic Cold Drawn Alloy Steel Bars are available in all popular analyses, in standard shapes and sizes, furnace treated as you desire—annealed, normalized, spheroidized, stress relieved or carbon corrected. Republic metallurgists are ready to help you get the results you need. Write for further information.

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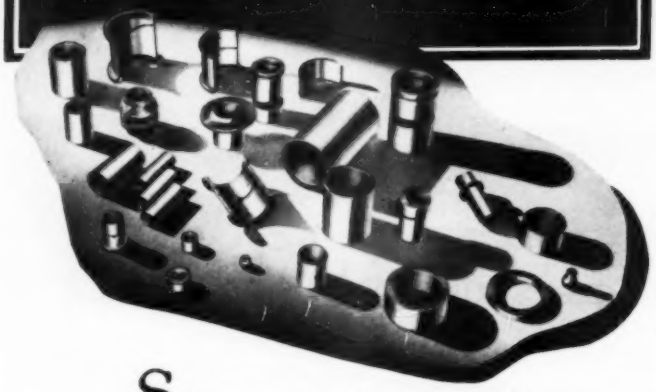
Republic COLD DRAWN
REPUBLIC STEEL
ALLOY STEEL BARS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

At Sleeve Bearing Headquarters

ANY TYPE YOU NEED



SUCH a complete bearing service has never been at your command before. You will find all types of sleeve bearings in the Johnson Bronze line, plus babbitt metal and Universal Bronze Bars. Whether you manufacture equipment that requires bearings, or whether you need bearings for maintenance or replacement, your surest source of supply is Sleeve Bearing Headquarters. Probably 90% of your requirements is available from stock, and will be delivered immediately. This saves you money, too, as well as time.

For your convenience, standard stock size bearings, babbitt and bronze bars are stocked by industrial distributors everywhere, and in Johnson branches in twenty industrial centers. For sleeve bearings made to your specifications, contact the Johnson Bronze branch office in your vicinity, or write direct to the main office.

Types of Bearings

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Johnson Bronze

SLEEVE BEARING HEADQUARTERS

515 SOUTH MILL STREET • NEW CASTLE, PA.

ployee's angle as well as our own. It is better to transfer or to give an employee a leave of absence rather than lose him. By being thoughtful of his interests we can often call on him in case of emergency.

I personally have more confidence in a man who turns in his notice of resigning than I do for an employee who is absent every second or third Monday. In the rehiring of old employees we should, of course, look at their former record of quality, production adaptability and punctuality. In the final analysis, an employee with a good record should be considered for reemployment.

A. E. Salmons
Philadelphia, Pa.

•

"A rolling stone may gather no moss", but the migratory worker can certainly pick up profitable ideas from employment in various plants. The worker who is alert and receptive in his quest for new ideas and makes an effort to broaden his own capabilities by changing jobs will certainly be of greater worth to himself and to any future employer. To those foremen who hesitate to rehire a former employee who left to better himself, it might be well that they remember this quotation: "There exist limitless opportunities in the industrial world. Where there is an open mind, there will always be a frontier." The foremen should admire the worker who had courage enough to pull up stakes in quest for more varied experience.

When a man stays in one plant too long, he will get stale. There is no better way to learn things than to get a slant on another shop's methods and ideas. The smart foreman will welcome the worker who had the initiative to obtain experience at other plants. Such experience will broaden his knowledge and prevent him from getting into a rut and as worn-out of new ideas as a woodpecker in a petrified forest. A certain amount of shift in the personnel of an establishment must be accepted as normal and necessary, if not indeed inevitable and desirable. Such movements of the labor force will probably continue as long as men desire to improve their standard of living by seeking larger incomes, or desire to increase their experience.

To some business executives, the shift in personnel seems desirable for another reason than being advantageous to the worker. They believe that new blood usually has a stimulating influence upon the enterprise and that when employees have been with a company for an

Replacing 4140 alloy steel with STRESSPROOF

REDUCED the COST of this shaft 25%

THIS splined drive shaft was originally made from 4140 hot-rolled, normalized, and machine-straightened alloy steel. After cutting to length, the bar was quenched and tempered to a machinable hardness and restraightened. By changing to STRESSPROOF, these quenching, tempering, and straightening operations were eliminated, steel cost was reduced, machining time was cut 33%, and the quality of the part was improved. Over-all reductions in cost afforded a net saving of 25%.

Cost-conscious manufacturers all over the country are realizing savings such as this, and higher . . . because of STRESSPROOF's unique combination of four important qualities *in-the-bar*. STRESSPROOF is twice as strong as ordinary cold-finished shafting and does not require heat treating. Its wearability—*without case-hardening*—is sufficient to replace many heat-treated or carburized steels. In addition, it machines fully 50% better than heat-treated alloys of the same hardness, and, being stress-relieved, it has a minimum of distortion. Yet, with all these advantages, STRESSPROOF costs little more than ordinary cold-finished shafting. It is available in cold-drawn or ground and polished finish.

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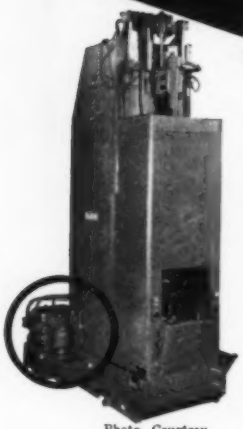
A Good Coolant Pump...

Saves You Money!



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The Oilgear Co.

Illustrated is an Oilgear Type XM-30 x 54" stroke Vertical Cyclematic Broaching Machine equipped with Ruthman Gusher Pump.

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RUTHMAN GUSHER COOLANT PUMPS

Ruthman Gusher Coolant Pumps save you money in two important ways:

1—Designed to do the job better, more efficiently, Ruthman Coolant Pumps offer you features that will help you raise production on your metal-cutting machinery. They give instantaneous coolant flow, split-second control of coolants from a trickle to full volume and use less power when throttled.

2—Precision-built of the best materials, Ruthman Gusher Coolant Pumps are dynamically balanced. Vibration and wear is cut to the minimum, assuring long trouble-free service.

Write us today—we will be glad to submit literature and any other information you may require.

THE RUTHMAN MACHINERY CO.

1818 READING ROAD CINCINNATI, OHIO

extended period they frequently come to regard themselves as possessors of an indefinite tenure of employment; a vested interest in the job, regardless of sustained efficiency. For this reason, it is sometimes desirable that workers make a change in their employment.

As far as the likelihood of the worker who changed jobs keeping on seeking new ones, examination of numerous statistical studies of labor turnover leads to the conclusion that unskilled labor shows the higest degree of instability, expressed in terms of voluntary quits, followed in turn by semi-skilled and skilled labor. The percentage of turnover is greatest among skilled workers during the year immediately following the periods of apprenticeship, largely because at such a time journeymen desire to gain the wider experience and improved knowledge and skill which invariably result from employment in different shops and industries.

As already indicated, skilled workers move about considerably during the years immediately followingg completion of apprenticeship, in order to increase their skill and experience. As they grow older, adult workers, both skilled and unskilled, tend to settle down and figure less in turnover rates.

I have heard the question asked —"How can a journeyman mechanic improve his skill and experience without journeying in search of employment at different plants?" The answer to that question lies in operation of a definite personnel policy on training and promotion of workers within the plant. The worker the personnel department at regulra should be given opportunity to improve his skill and experience in the plant without having to seek for these opportunities elsewhere. The worker should be interviewed by the personnel department at regular intervals to assure that he is adjusted to his work and satisfied. He should be given individual consideration, and reports of the man's foreman should be used in evaluating his work, as a guide to merited promotion. The ambitious worker must not be forgotten or permitted to remain in work which does not have a future for him. Workers are entitled to make progress. Lack of ability or the necessary qualifications should be the only obstacles. When a worker is capable of performing more important tasks than his department has to offer, there should be opportunity for transfer.

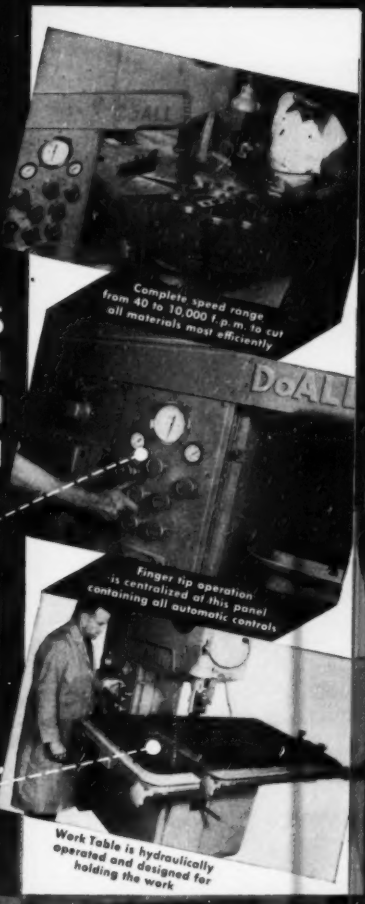
When it comes time for rehiring a former worker, it is believed that

DoALL's

MANUFACTURING MACHINE TOOL

THE NEW *Contour-matic...*

HAS **55** NEW FEATURES
IN ITS ADVANCE DESIGN
FOR FASTER PRECISION
PRODUCTION


Complete speed range from 40 to 10,000 f. p.m. to cut all materials most efficiently
Finger tip operation is centralized at this panel containing all automatic controls
Work Table is hydraulically operated and designed for holding the work

Now with ONE MACHINE Cut every METAL!

PLUS ANY OTHER SOLID MATERIAL

Employs 244 different band tools for machining, sawing, grinding, honing, filing, slicing, friction sawing and polishing

DoALL Company

Des Plaines, Ill., U.S.A.

Cable Address: DoALL, Des Plaines

Representatives in 56 Countries

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Lovejoy Type "A" milling cutters are unsurpassed for removing metal quickly, accurately and smoothly. And a big PLUS feature is blade design—H.S.S., carbide and cast alloy blades are interchangeable in any Lovejoy Type "A" housing ever built—from 4½" to 24" in diameter! No need to carry a large stock of blades because Lovejoy gives immediate delivery from its own large stock.

Another asset is Lovejoy's exclusive "positive-locking" device. This means that a minimum of stock must be removed when sharpening blades. It allows use of a large percentage of each blade. It holds blades immovably even during heavy intermittent cuts.

The Lovejoy man near you will be pleased to give details and production estimates on your own work.

"TOOL BITS"

Type "A" face mills are available for all standard arbor mounts (National and Lovejoy) and standard spindle mounts (National, Ingersoll, Universal, Giddings & Lewis and Lucas). Details will be found in Lovejoy Catalog No. 28. If you have unusual jobs requiring special cutter designs, call on Lovejoy the "specialists on specials."

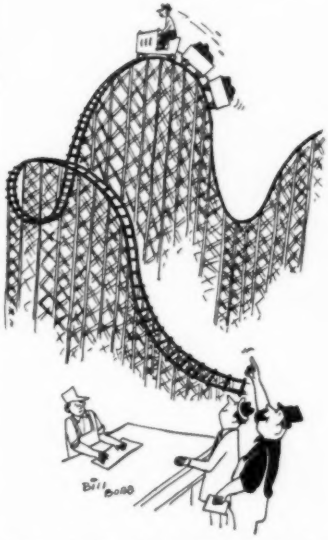
Lovejoy
TOOL COMPANY, INC.
SPRINGFIELD, VERMONT

Write for Catalog No. 28

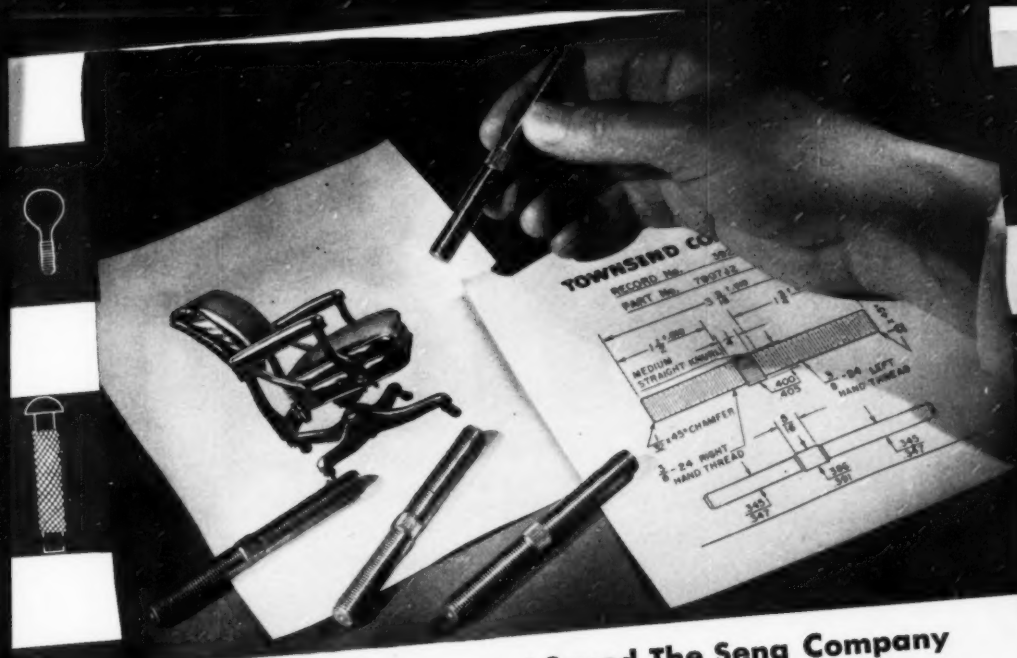
each case should be handled on its own merits. It is often true that the former employee may have quit due to wanderlust or temperamental peculiarities that did not involve a desire to better himself. Many workers are habitually migratory and restless, possessing an almost insatiable desire to roam. They are naturally unstable. They work a few months and then because the old spirit of wanderlust overpowers them, they journey to some indefinite destination. This type of wanderlust-employee should not be confused with the man who has the desire to avail himself of more attractive opportunities elsewhere, where the rate of pay is higher, hours and conditions of employment are more satisfactory, promotional opportunities are greater, or there is a better chance to learn a trade.

When the worker gets the "itch to travel" the fault may also lie in the kind and type of supervision he has been getting. Immaturity of supervisory activities may show up in high turnover. Many mechanics work with the brakes on simply because they have second-rate supervisors. In some plants, many employees feel hesitant in talking over their work or ideas with their bosses, or expressing their honest opinions, and believe that their supervisors are making little or no effort to make them feel they are part of the company.

Harry Kaufman
Philadelphia, Pa.



"That's Martin—with his experience at the amusement park he was able to develop his materials-handling system!"



Here's How Townsend Saved The Seng Company $27.63 Per Thousand On One Cold Headed Part

This is an example of how a Chicago manufacturer, *who might have been you*, saved a large amount of money through the use of a Townsend cold headed part and thereby produced a better product for less money. The threaded adjusting screw (illustrated above) for the tilt back of the Seng action control for executive chairs is now being produced at Townsend by cold heading, knurling and roll threading for only $16.87 per thousand. The lowest price quoted for screw machine production was $44.50. This clear saving of $27.63 per thousand is important because Seng chair action control production is extremely high. Not only that, the Townsend part, being cold formed, is stronger than a part machined from bar stock and the roll threads are tougher and more uniform than machined threads. This gives The Seng Company an adjustment screw that works easily and helps produce a better chair at less cost.

This is not an isolated case with Townsend engineered parts and fasteners. It is typical of how Townsend helps save money and time by working closely with manufacturers in designing parts for many applications. Townsend parts and fasteners are cold headed, pointed, machined, drilled, slotted, trimmed, roll threaded, extruded, pierced, knurled, bent or flattened. They are produced in carbon, alloy and stainless steels—in brass, bronze, copper, aluminum—in a variety of platings and finishes.

To find out how to reduce costs and improve your products with Townsend cold headed parts send us a sample or sketch of the parts you need. Our engineers will gladly give you an estimate without obligation.

Call or write today to:

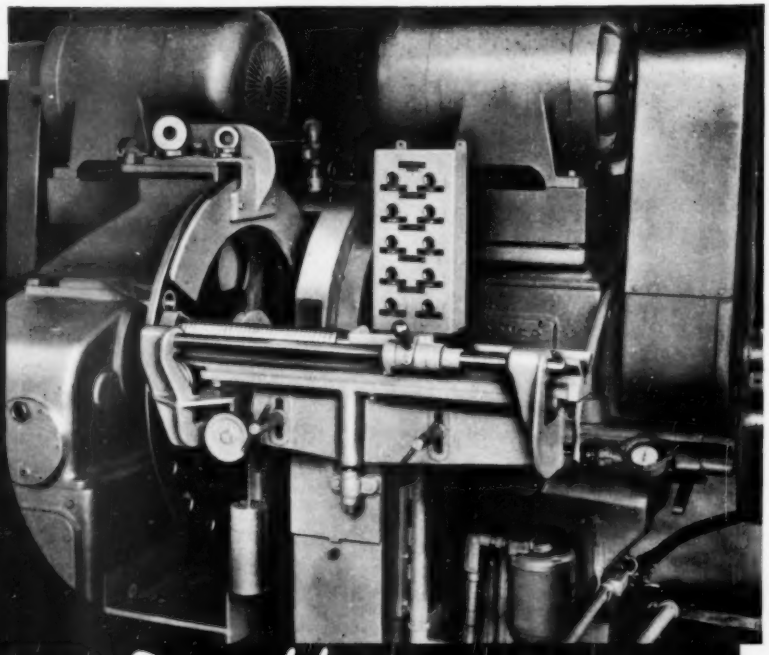
Townsend

COMPANY — ESTABLISHED 1816

New Brighton, Pa.

Chicago 38, Ill.

Improve the CUT —and CUT the COSTS— with GARDNER *Double* GRINDERS!



As competition becomes keener, quality and costs become increasingly important. With many types of parallel-surfacing operations, GARDNER *Double* GRINDING both *improves* the accuracy of the *cut*, and *cuts* the *cost* of production.

WORK DATA

Part: Gear Blanks
Material: Steel
Operation: Grind Two Sides
Tolerances: .001" for Parallelism and Uniformity
Stock Removal: .015" Maximum (Roughing Cut); .001" to .002" Maximum (Finishing Cut)
Production: 18 to 20 Pieces Per Minute, Per Cut.
Feed: Hand Load to Trough-type Feed Attachment; Automatic Unload
Machine: #125-26" Gardner Double Grinder

As in the example shown above, specially adapted, semi-automatic fixtures keep the parts moving between two opposed grinding wheels, where TWO sides are ground with ONE pass through the machine.

***SPEND* Money to *SAVE* Money!**

You can help make more sales — and more profits — by investing in quality-improving, cost-cutting GARDNER *Double* GRINDERS.

Use Modern GARDNER WIRE-LOKT Abrasives on YOUR Disc Grinders!

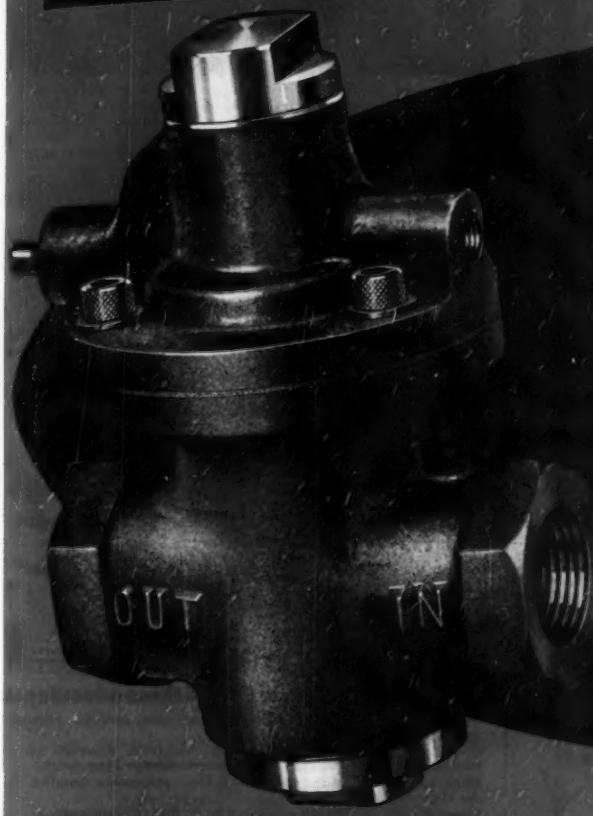
GARDNER-GRIND YOUR *Flat* SURFACES

Write for Latest Bulletin on Gardner DOUBLE Grinding!

GARDNER MACHINE COMPANY

410 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.

New ROSS "Water-Saver" Valve CUTS COOLANT COSTS!



INSTANT CUT-OFF ASSURED

Now waste of expensive coolants can be eliminated . . . their use confined to required periods!

The Ross "Water-Saver" or Time Delay Valve is the answer. It turns on the coolant and lets it run when needed . . . then automatically shuts it off. The flow can be maintained for any period from 3 seconds to 3 minutes after the machine cycle.

Operation of the valve is entirely automatic. No electrical or mechanical motivation is required since it is activated by cylinder pressure.

The Water-Saver Valve is a straightway or shut-off model, normally open or closed to water supply, and is available in ¼ to 1¼ pipe sizes.

Get complete details today . . . no obligation whatsoever.

Ask Ross for Any Air Control Information

Ross makes valves only—hundreds of types and sizes. Take advantage of the experience gained in over a quarter century of concentration on control and application of air power!

ROSS Air Control VALVES

ROSS OPERATING VALVE COMPANY

120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

When you need the right gear *in a hurry*

It's one thing to get a gear cut exactly to your specifications . . . and another to get it *on time*. To be sure of satisfaction *both* ways, there's only one safe thing to do: specify Grant gears. For, whether you order by 'phone, telegraph or letter, Grant will have just the gear you want on its way in a matter of hours.

Next time a gear breakdown threatens a costly production tie-up, remember Grant's "in-the-pinch" service. Send today for free catalog of "In Stock" gears.

Reduction Units?
Grant has all types.
Write for catalog.

GRANT GEAR WORKS, INC.
169 W. SECOND STREET
SO. BOSTON, MASS.

Grant FOR GEARS

Only $2.98 helps put new "sell" in television advertising

Sponsor of television show had to refilm his commercials to meet a new selling problem. New films picked up at the studio 4 P.M., delivered to TV station 800 miles away 8:47 P.M. same evening. Air Express cost for 11-lb. carton, $2.98. (In undramatic fashion Air Express keeps radio, television or any business rolling.)

Remember, $2.98 bought a complete service in Air Express. Rates include door-to-door service and receipt for shipment—plus the speed of the *world's fastest* shipping service.

Every Scheduled Airline carries Air Express. Frequent service—air speeds up to 5 miles a minute! Direct by air to 1300 cities; fastest air-rail to 22,000 off-airline offices. Use it regularly!

Only Air Express gives you all these advantages

Nationwide pick-up and delivery *at no extra cost* in principal towns, cities.

One-carrier responsibility *all the way*; valuation coverage up to $50 without extra charge. And shipments always *keep moving*.

Most experience. More than 25 million shipments handled by Air Express.

Direct by air to 1300 cities; air-rail to 22,000 off-airline offices.

These advantages make Air Express your best air shipping buy. Specify and use it regularly. For fastest shipping action, phone Air Express Division, Railway Express Agency. (Many low commodity rates in effect. Investigate.)

SPECIFY AIR EXPRESS
GETS THERE FIRST

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SCHEDULED AIRLINES OF THE U.S.

Save TIME and MONEY in DIE BUILDING

with RB Interchangeable PUNCHES and DIES

RB punches and dies cut die-making costs because they permit use of standardized RB retainers which are quickly and accurately mounted. Completely interchangeable, RB punches, dies and their retainers eliminate large inventories and, unlike most parts used in die construction, have a salvage value.

Quickly and easily installed, yet securely locked both vertically and radially, RB punches and dies reduce press "down time" too, because they enable operators to make quick changes.

RB standard punches and dies are stocked for immediate delivery. Punches and dies of special sizes, shapes and materials are made promptly to your specifications.

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PRONOUNCED "MACK-IT"

Mac-it ¼" x 2½" Hollow Set Screws have grip of more than 17,000 pounds.

BETTER, FASTER SERVICE WITH THIS *COMPLETE* MAC-IT LINE!

Because many standard types of Mac-its are stocked throughout the country for quick delivery, and because specials can be engineered to your own specifications, you'll find it pays to investigate Mac-its *first*.

Mac-it's 35 years' experience in the manufacture of heat-treated, alloy steel screws is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada. Write for new catalog today!

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- Hollow Lock Screws
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- Stripper Bolts
- Hollow Pipe Plugs
- Socket Screw Keys
- Square Head Set Screws
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- . . . and many others

Marketed Nationally Since 1913 by

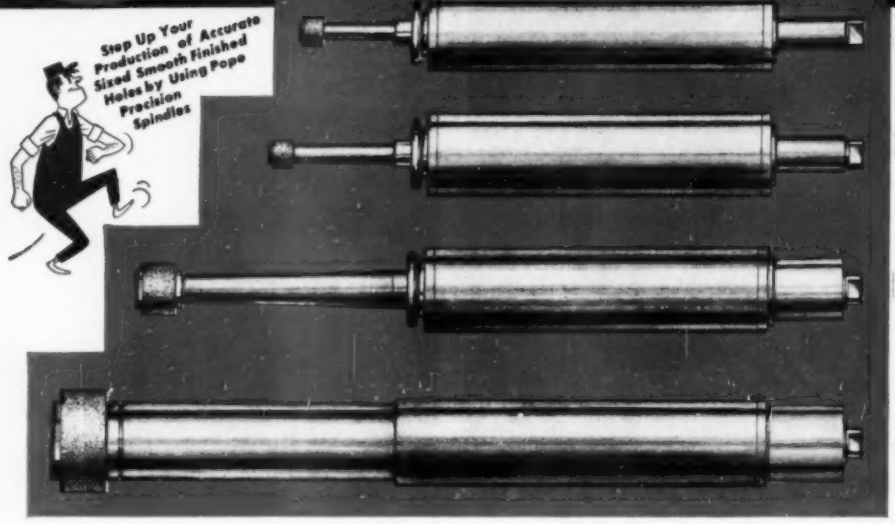
STRONG, CARLISLE & HAMMOND COMPANY

Cleveland 13, Ohio

Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

7 sound reasons why

POPE PRECISION INTERNAL GRINDING SPINDLES WITH THE POPE SEALED-IN LUBRICATION SYSTEM ARE THE RIGHT SPINDLES FOR YOUR GRINDERS



1. **Increased Production.** Pope Spindles speed up output because they can take heavy cuts.
2. **Better Finished Ground Holes.** The precision craftsmanship used in the manufacture of Pope Spindles assures work of the highest standard.
3. **Increased Wheel Life** because the shaft is rigidly supported by bearings of ample size, properly preloaded to withstand both radial and axial loads.
4. **Super Precision Bearings** made to Pope specifications are used exclusively in Pope Spindles. These bearings are all international standard sizes.
5. **Operating Time Saved** by eliminating frequent change of motor pulleys. Pope Internal Grinding Spindles are designed to be driven from the same motor pulley except in rare and special applications.
6. **No Lubrication** is required during the life of the bearings. Time is saved and production is increased by not having to add oil or grease to the bearings periodically. The lubrication is sealed in during bearing assembly by skilled craftsmen in a clean, dust free, air conditioned room, properly tooled up for the job. There are no more time-consuming breakdowns caused by dirt or abrasive entering the bearings through the oiling system. With the Pope Sealed-In Lubrication System, all foreign matter is sealed out at the same time lubrication is sealed in.
7. **Dynamic Balance.** Pope Spindles are dynamically balanced with all their rotating parts in full assembly.

These seven features add up to better work and more of it per day at lower cost. In other words you make more money when you standardize on Pope Spindles.

Pope Precision Internal Grinding Spindles come in the sizes, shaft extensions and speeds (up to 35,000 RPM) to meet your every need. Ask for new catalog No. 57.

No. 63

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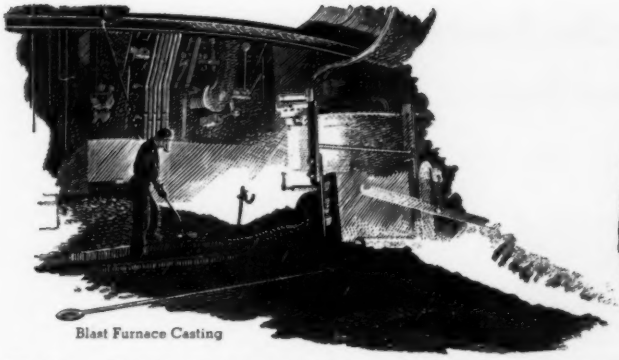
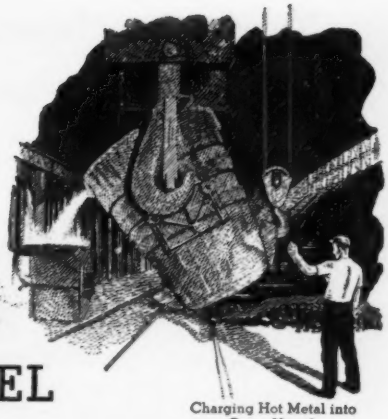
BUILDERS OF PRECISION SPINDLES



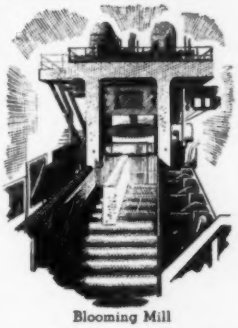
Blast Furnace Casting



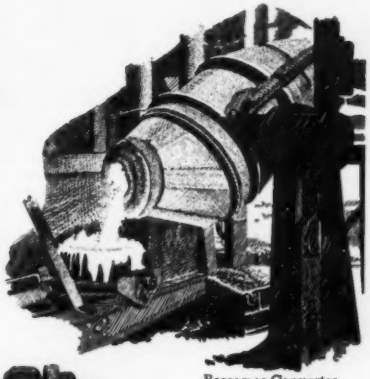
Charging Hot Metal into Open Hearth

AS GOOD AS THE STEEL
from which they are drawn

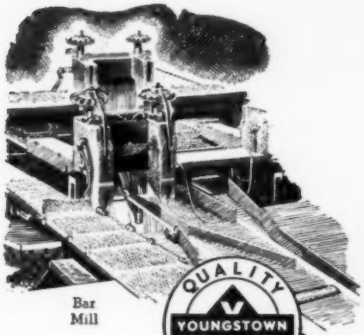
THE experience of nearly 50 years in producing Youngstown Steel in grades and analyses to meet our customers' most exacting requirements is your best insurance of the high quality of Youngstown Cold Finished Bars.



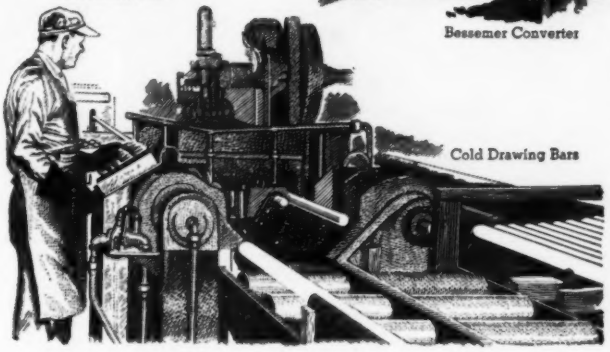
Blooming Mill



Bessemer Converter



Bar Mill



Cold Drawing Bars

QUALITY V YOUNGSTOWN SERVICE

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COLD FINISHED CARBON AND ALLOY STEEL BARS

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

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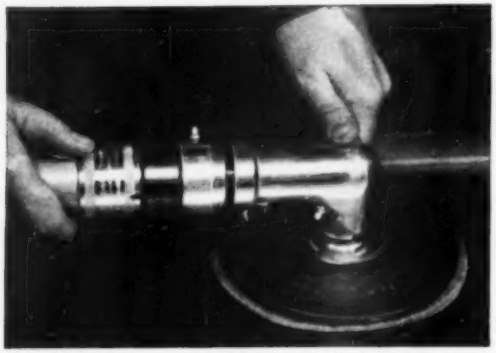
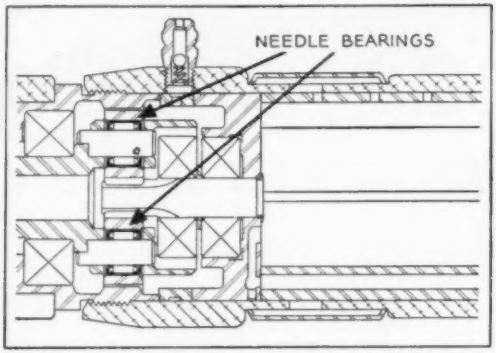
Torrington Needle Bearings Increase Power Output 10% in ARO Pneumatic Tools

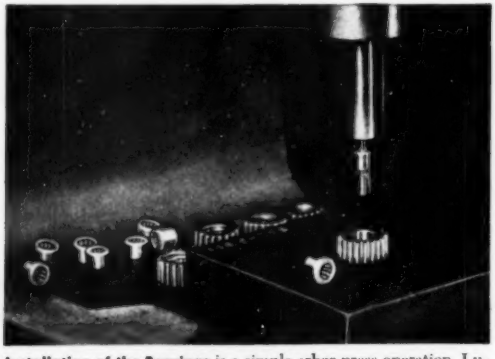


By Applying Torrington Needle Bearings in the planetary gears of the Model 7099 Screwdriver and Model 7095 Sander, Aro Equipment Corporation, Bryan, Ohio, increased power output 10%. This increase in efficiency, determined by special tests, is accompanied by reduced lubrication and maintenance, and longer service life.



No Major Design Changes were needed to adapt Needle Bearings to this application, shown above in cross-section. These compact anti-friction units met the space and weight limitations ideally, with no sacrifice of reliability. The full complement of small diameter rollers assures tremendous radial capacity.

Service Life Tests were run for as much as ten times the normal life of the tools. Previously, the planetary gears, shown above, had been a trouble spot – but the Needle Bearings and the pins that serve as shafts showed no appreciable wear when tests were completed.



Installation of the Bearings is a simple arbor press operation. Lubrication is greatly simplified, since the turned-in lips of the shell of Needle Bearings retain an ample reserve of lubricant. With wear reduced to a minimum, savings in maintenance may run as high as 20 to 1, according to the manufacturer's experience.

This case shows how the performance, lubrication and service life of *your* equipment can be improved by a simple change to Torrington Needle Bearings. Let our engineers help you adapt them to your needs. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and distributors in principal cities of United States and Canada.

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller

Straight Roller • Ball • Needle Rollers

The constant UNIFORMITY of Mueller Brass Co. Red Tip Rod saves tools, grinding and "down-time". Brass Rod users throughout the United States and abroad know this and they continue to use it year after year. THEY ARE ACTUALLY PINNING MORE PROFIT TO THEIR COST SHEETS.

There isn't any mystery in the manufacture of FREE TURNING Brass Rod.

But, there are two intangibles that do produce quality Rod, and these are UNIFORMITY and "know-how".

During the past 32 years the Mueller Brass Co. has specialized in making FREE CUTTING Brass Rod, and during that time has acquired a certain "know-how" that cannot be expressed or measured. This "know-how", together with constant UNIFORMITY, are the only "secret" ingredients. The chemical composition, structure, temper and mechanical properties are so closely controlled that no perceptible variation in machinability is noted from rod to rod.

We are constantly producing Brass Rod that will meet any specification. If you want it for knurling, we make it—or for deep drilling, thread forming or for bending, expanding or flaring—or just an all-purpose, extra-fast, easy-cutting Rod, we make it. Our Technical Engineers and Laboratory are at your disposal any time.

Millions of pounds of brass rod are manufactured in our mills each month. Shipment can be made at once from our large factory stocks.

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PORT HURON, MICHIGAN

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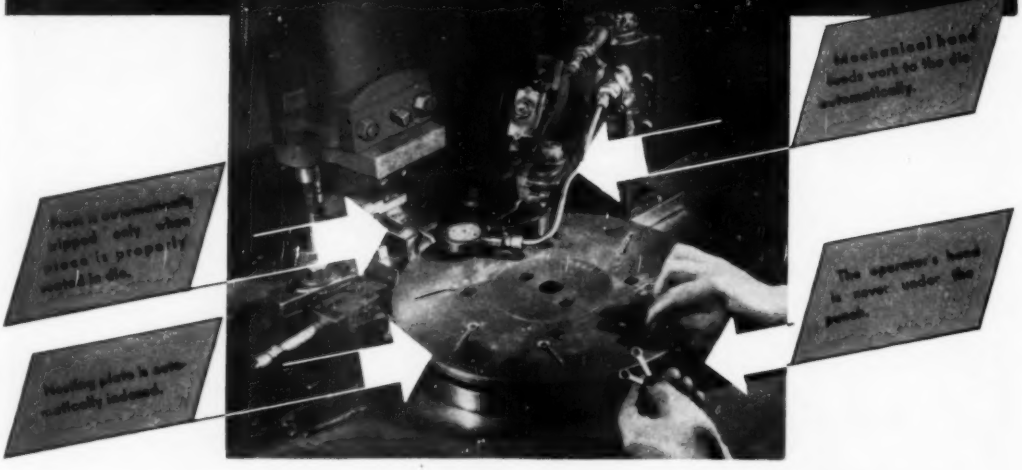
The V & O FEED-O-MATIC Press Feeder that increases punch press production 50 to 200% *with Safety!*


Mechanical hand feeds work to the die automatically.
Press is automatically tripped only when piece is properly seated in die.
The operator's hand is never under the punch.
Nesting plate is automatically indexed.

Users will tell you: When the V & O Feed-O-Matic takes the place of manual feeding for secondary die operations — punch press production increases 50 to 200%!

What's more, the V & O Feed-O-Matic reduces operator fatigue by automatically tripping the press. The operator simply — and with safety — places each piece into the automatically-indexed nesting plate, which conveys the blank to a micro-switch-equipped mechanical hand that transfers it to the die.

The V & O Feed-O-Matic increases die life, too. First, by placing work in the die with undeviating accuracy, wear on dies is minimized; second, by not tripping the press unless the part is in register, costly shut-downs, caused by damage to dies and presses, are averted.

The V & O Feed-O-Matic can be applied to any make of press . . . requires no special dies . . . and can be set-up for new work in an hour or less.

FREE BOOKLET
Write, today, for your copy of the illustrated Feed-O-Matic booklet, which gives you full details, including specifications.
This mechanical hand
The FEED-O-MATIC

the V&O PRESS CO.

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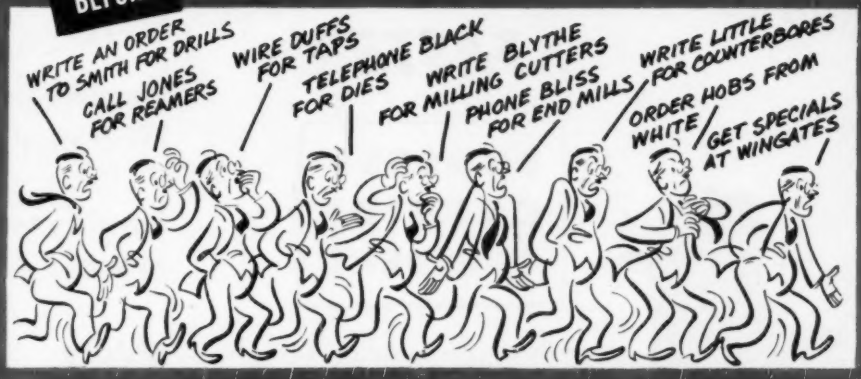
SAVE TIME AND MONEY

BEFORE


WRITE AN ORDER TO SMITH FOR DRILLS
CALL JONES FOR REAMERS
WIRE DUFFS FOR TAPS
TELEPHONE BLACK FOR DIES
WRITE BLYTHE FOR MILLING CUTTERS
PHONE BLISS FOR END MILLS
WRITE LITTLE FOR COUNTERBORES
ORDER HOBS FROM WHITE
GET SPECIALS AT WINGATES

AFTER

Write just one order to our Mill Supply Distributor for Standard Shield Brand Drills, Reamers, Taps, Dies, Milling Cutters, End Mills, Counterbores, Hobs and special tools.

Purchasing is simplified when you *Standardize*

It's less costly, too, in time and money—but that isn't all when you specify Standard Shield Brand metal cutting tools. You save time in requisitioning, in stock keeping, in the tool crib, in setting up work and production gains because Shield Brand Metal Cutting Tools are Foremost Quality—in design, material and workmanship.

Leading Mill Supply Distributors coast to coast can give you prompt delivery of Standard Shield Brand Tools.

STANDARD TOOL CO.

Successor to The Standard Tool Company

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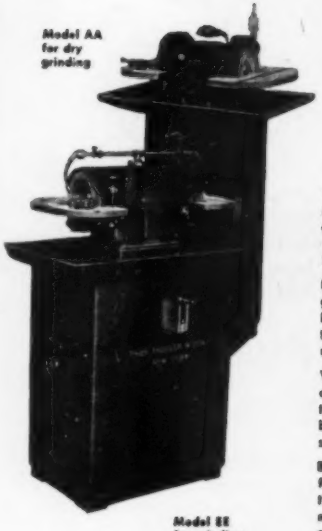
THE STANDARD LINE: Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools

GRIND TOOLS TO EXACT ANGLE ..FASTER



Model AA for dry grinding

Model EE for grinding wet or dry

PROSSER CARBIDE GRINDERS

YOU GET the grinding angle you want *instantly* with the famous indexing feature of these Prosser high-speed grinders. The quick-acting tables need never be raised or lowered—and once set, they stay put.

ECONOMICAL—You'll save time and you'll get more for your wheel dollar with a Prosser because wheels are easily adjusted to compensate for wear. Wheels can be used up practically 100%.

VERSATILE—Designed by the same Prosser engineers who introduced cemented carbide to American industry, today's Prosser Carbide Grinders are equally effective on stellite and high-speed steel.

Before you get a grinder for rough work or fine finishing, wet or dry . . . get the facts on the Prosser. For details on bench and floor models, on chip-breaker, drill-grinding and other attachments . . . write for literature.

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Here is a wealth of practical information on the use of Functional Painting. This Special Report's 16 pages . . . illustrated in full color . . . provide you with valuable data on planned color in the shop as an aid to better production.

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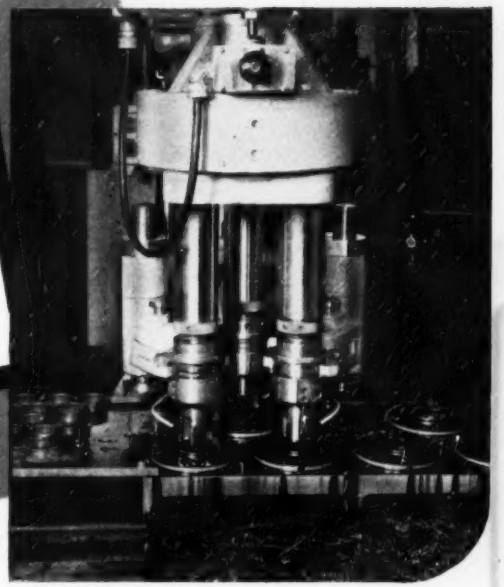
Taps

360 Holes Per Hour



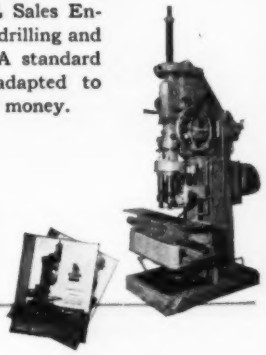
1-1/2"—20 THREADS

ON BARNESDRIL

STANDARD DRILLING MACHINE

Holes 1½"—20 are tapped, 6 pieces per minute, in a semi-automatic cycle arrangement on this Standard BARNESDRIL Drilling Machine, through the addition of air-operated fixture and controls and 3-spindle auxiliary head. Loading takes place while machining progresses. At any time, the machine can be converted to other types of work, thus avoiding the limitation of single-purpose equipment.

Easily replaceable equipment—minimum maintenance problems—parts available from stock—these are important advantages in tooling for high production machining. Standard machines, equipped with special tooling and equipment can frequently solve these problems, with savings in time and investment. See your BARNESDRIL Sales Engineer on your next drilling and tapping problem. A standard machine may be adapted to save both time and money.



Send for this booklet! Applications of special tooling, specifications and new features on Standard Drilling Machines. Ask for Bulletin B-1184.

BARNES DRILL CO.

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STANDARD ENGINEER'S CASE FILE

Case 1146—Selecting the Correct Cutting Fluid

MULTIPLE SPEED RADIAL DRILL

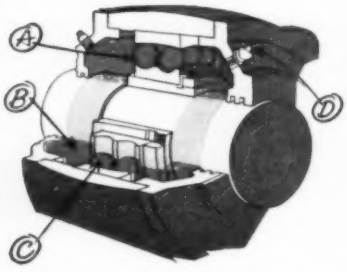
In tests on machine tools of all different types, the Calol Cutting Fluid recommended for each operation produced fine surface finish on work. This is because recommendations for Calol Cutting Fluids are made from actual working results — tests made on a special drillpress, the Drilling Torque Tester — and the results recorded by electronics. Calol Cutting Fluids come in four general classes: mineral oils, ready-mixed compounded oils, concentrates and soluble oils.

A. Made for every machining operation — from toughest broaching to simple grinding.

B. Lubricating, cooling and flushing qualities assure longer tool life and better work finish.

Calol Cutting Fluids also give maximum rust protection to machine tools and work. The soluble oils in the line mix with water easily and form strong, stable emulsions.

Case 1147—Lubricating Bearings Carrying Extreme Loads



HEAVY-DUTY INDUSTRIAL BALL BEARING

In tests by a bearing company, Calol E.P. Roller Grease carried bearing loads in excess of 20,000 pounds per square inch, more than twice the load-carrying capacity of ordinary greases. For anti-friction or plain bearings. Comes in three grades and two types: Nos. 0, 1X and 2X. The "X" type has additional compounding to impart extra stringiness, and extra adhesiveness to withstand washing action of water.

A. Extreme-pressure additives assure lubrication under extreme shock load conditions.

B. Resists extreme temperatures — has lubricated satisfactorily in bearing temperatures of more than 200° F.

C. Non-corrosive to any bearing metal . . . will not harm rubber, neoprene or plastic bearing seals.

D. Pumps easily in low temperatures . . . may be used in all grease pressure systems.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, N. J., Chicago, New Orleans

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

CALOL

Trademark Reg. U.S. Pat. Office

There's a Century MOTOR To Supply Dependable Power For All Popular Applications

Century motors are available in sizes from 1/6 to 400 horsepower, in a wide range of types and kinds—single phase and polyphase alternating current, and direct current. All of them are ruggedly built to assure top performance throughout a long service life.

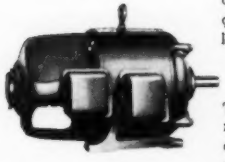
POLYPHASE

Type SC—OPEN PROTECTED—Form J, general purpose motor—meets the needs for most installations where operating conditions are relatively clean and dry. The top half of the motor frame is closed to keep out falling solids or dripping liquid.

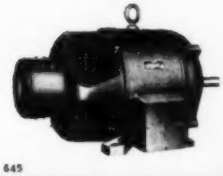
Type SC—SPLASH PROOF—gives the necessary protection where plants must be washed down—keeps water out of the motor even when a hose is applied directly on the frame. Also provides protection against rain, snow, sleet and ice for outdoor installations.

Type SC—TOTALLY ENCLOSED FAN COOLED—protects against dusts, mist or fog detrimental to the vital parts of the motor. The inner frame protecting the motor is sealed to keep out harmful matter.

Type SC—EXPLOSION PROOF protects against atmospheres charged with explosive dusts or gases. They carry Underwriters' label for specific kinds of hazards.



Type SR—SLIP RING—wound rotor motors are suitable for applications requiring low starting current with high starting torque, reversing, or adjustable speed.

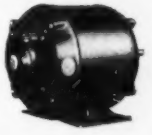


Type SY—SYNCHRONOUS MOTORS—suitable for continuous operation at a uniform load for power factor correction.

SINGLE PHASE

Type RS—REPULSION START INDUCTION—single phase brush lifting motor suitable for applications requiring high starting torque with low starting current.

Type CSH—CAPACITOR START INDUCTION—single phase motor suitable when high starting torque with normal starting current is required.



Type SP—SPLIT PHASE, INDUCTION—single phase motors—suitable for light starting duty.

DIRECT CURRENT

Type DN—DIRECT CURRENT MOTORS—suitable for use where direct current is available or its use desirable.

These illustrations are typical of Century's complete line of motors. Others available include gear motors, generators, AC and DC motor generator sets.

Specify the right Century motor for all your electric power requirements.

Popular types of standard ratings are generally available from factory and branch office stocks.

CENTURY ELECTRIC COMPANY

1806 Pine Street
St. Louis 3, Missouri

Century Electric Motors

645

Typical and Data Proofs in Principal Cities

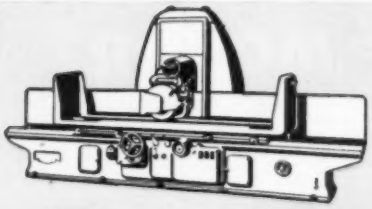
MATTISON GRINDERS

If its a Flat Surface to Grind
There's a Mattison to Grind it.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison now is in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced fixture engineers are available to give you best production efficiency with Mattison Machines.

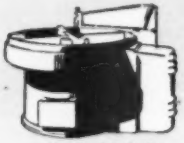
For any flat grinding, ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalog on all machines, ask for free copy of general bulletin.

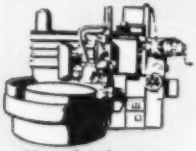


Precision Surface Grinders
Horizontal Spindle

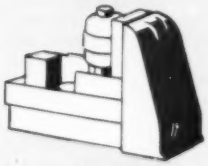
Disc Grinders,
Double Spindle Type



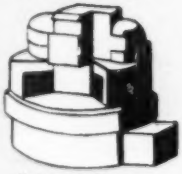
Vertical Spindle
Disc Grinders



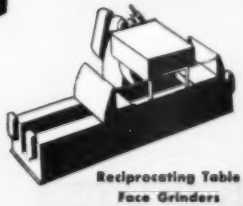
Plano Grinders,
Rotary Table Type



Rotary Table
Surface Grinders

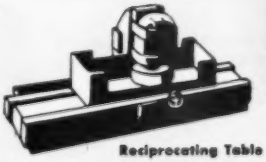


Automatic Rotary
Surface Grinders



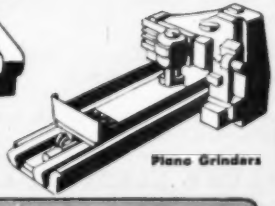
Reciprocating Table
Face Grinders

Disc Grinders,
Single Spindle Type

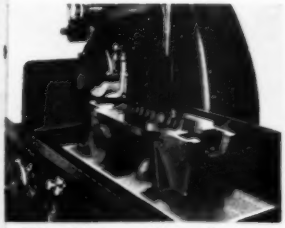


Reciprocating Table
Surface Grinders
Vertical Spindle

Face Grinders,
Traveling Wheel

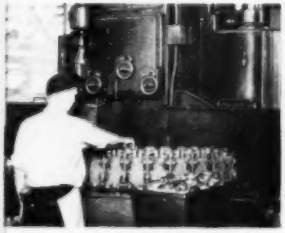


Plano Grinders

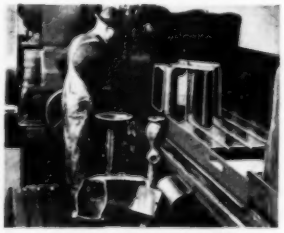


40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder

320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder

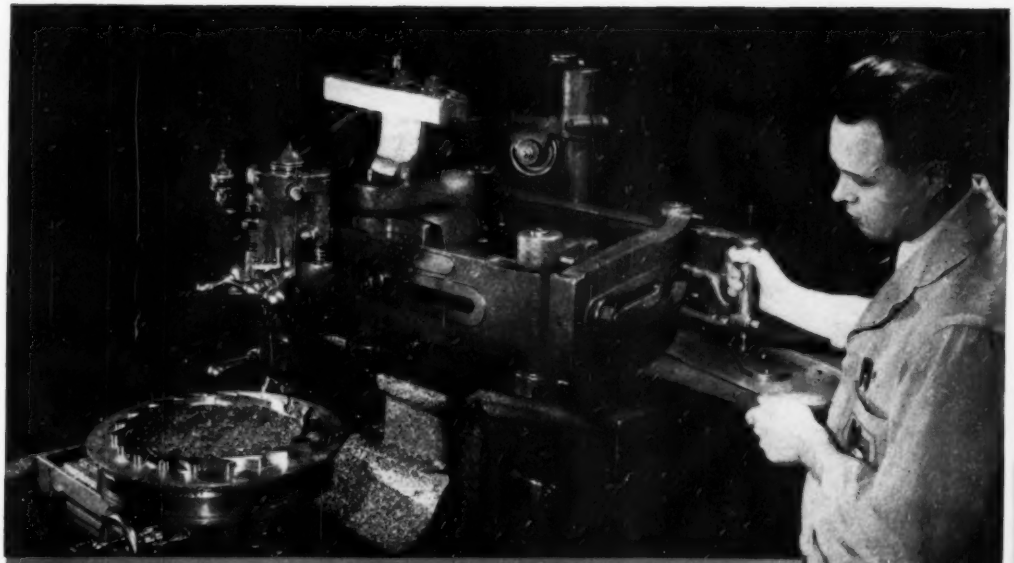


900 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder



Shows variety of work run on Mattison Face Grinders

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS



A 5-Day Job Done in 10 Hours!
PROFILE MILLING STAINLESS STEEL with GORTON and Tracer Control!

This experimental short run job was done on a Gorton *Profiling Pantograph* with a simple, over-size master and tracer control for the Elliott Company of Jeannette, Pa. Completely automatic tooling for a production run would save an additional 6 hours. Compare this with any other method.

This is just one example of cost saving made possible with Gorton Tracer Controlled Equipment which includes die and mold duplicators, pantograph machines, super-speed vertical mills and plain type horizontal mills. Gorton features high spindle speeds, wide versatility and high precision.

Ask for Production Estimate . . .

We will be glad to furnish a production estimate on your work — send us complete description with prints — no obligation.

THE JOB IN BRIEF

MATERIAL — Stainless Steel

OPERATION — Profile 20 turbine blades ½" deep from the solid in a circle 13.155" outside diameter.

FIXTURES — Gorton Rotary Table and 3 times-size master cut from sheet iron.

CUTTERS — 2 carbide 2-flute and 2 H.S. Steel 4-flute.

TIME — 10 hours; Finish better than 30 micro inches. Time Saving over any other method 40 hours or better.

REMARKS — Tooled for Automatic high production work, the time would be cut to 4 hours.

SEND FOR BULLETIN 1655 today! This provides information on all Gorton tracer-controlled machines.

GEORGE GORTON MACHINE CO.

Tracer Controlled Milling

1510 RACINE STREET, RACINE, WISCONSIN, U. S. A.

How to make sure THE DRIVE YOU BUY TODAY ...will meet tomorrow's needs!

RELIANCE V★S DRIVE

Conveniently-packaged, factory-wired V★S Drives are available from 1 to 200 hp. Two or more motors may be operated simultaneously from a single Control Unit.

The need for stepping up your operations in the future may require successively greater speed ranges; to settle for a drive limited to today's needs may be a costly saving. A Reliance engineer, consulted early in your deliberations, will study your present operations and consider your future plans.

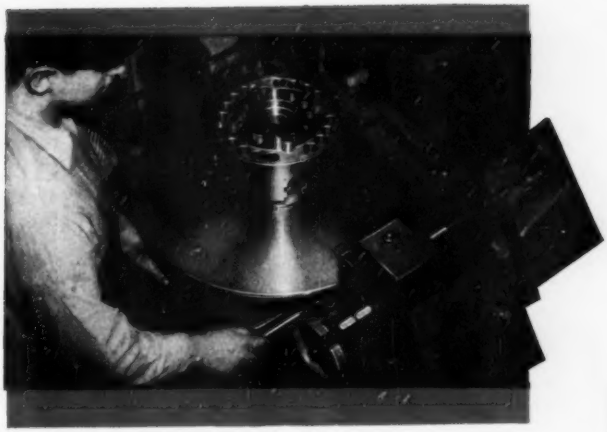
Every Reliance engineer is able to draw on a wealth of specialized "Know-how" gained in applying Reliance Drives in all types of operations in every industry for over 40 years. And to meet your present and future needs more precisely, he can provide Reliance V★S, the All-electric Adjustable-Speed Drive for A-c. Circuits, in either Rotating or Electronic systems or a combination of both. Call a Reliance application engineer when there's a drive problem to be solved, or write for Bulletin 311.

Sales Representatives in Principal Cities

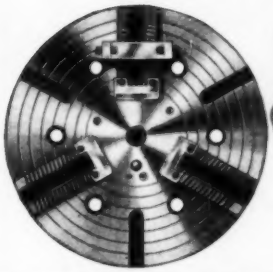
RELIANCE ELECTRIC AND ENGINEERING CO.

"Motor-Drive is More Than Power" 1075 Ivanhoe Road • Cleveland 10, Ohio

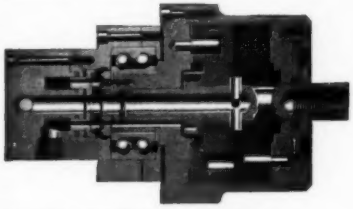
Super-smooth
***High speed* OPERATION**
OF CHUCKS AND AIR
CYLINDERS *with*_____



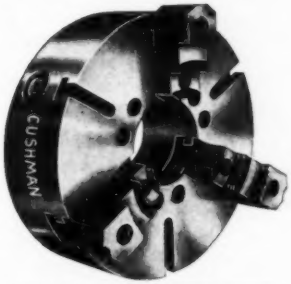
CUSHMAN *Static* BALANCING



CUSHMAN "ACCRALOCK"* POWER CHUCK



CUSHMAN ROTATING AIR CYLINDER



CUSHMAN WRENCH OPERATED CHUCK

*"Accralock" Registered Trademark

12CB49

Today, with the increasingly high speeds at which precision machine tools are operating, it is essential that vibration and chatter be eliminated from work holding and control equipment.

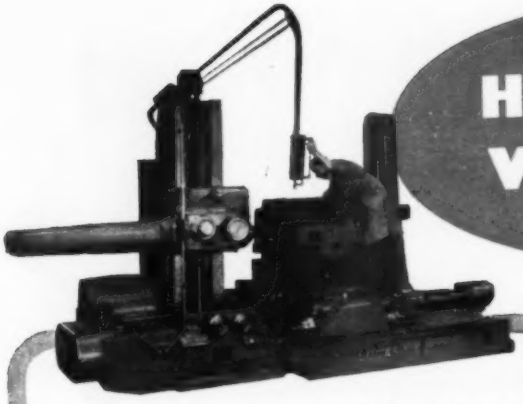
With Cushman Power and Wrench Operated Chucks . . . and with Rotating Air Cylinders, you are assured of a new degree of smoothness in operation. This is due to our accurate Balancing Checks throughout manufacture and after assembly of chuck bodies and cylinders. No product is shipped without a final static balance test . . . using the Gisholt Static Balancing Machine illustrated above. We believe this feature to be of great value to buyers of Cushman equipment to be used either for manual or power chucking.

Bulletins covering Cushman "Accralock"* Power Chucks, Wrench Operated Chucks, Power Wrenches and Rotating Air Cylinders, on request.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut

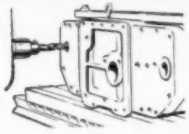
Consult CUSHMAN

Chucking Engineers Since 1862

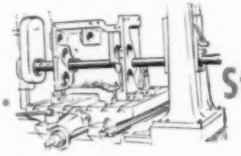


HERE'S LUCAS VERSATILITY

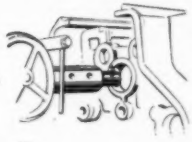
Accurately spaced drilling and boring . . .



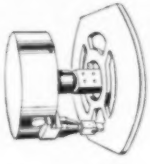
Line boring . . .



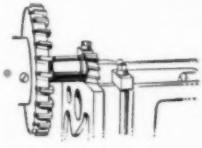
Stub boring . . .



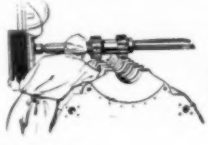
Facing . .



Face and end milling . . .

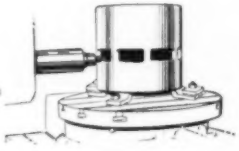


Milling with arbor . . .

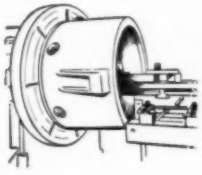


Milling with power

rotary table . . .



Turning . .



. . . just part of a day's work for a Lucas horizontal boring, drilling and milling machine . . . the precision "one man machine shop." Not just a highly accurate tool room machine, but big and rugged for production work too. So versatile and adaptable, it is rarely idle in any shop.

Mechanically controlled 3" and 4" spindle models. Also 4", 5", and 6" spindles with remote all-direction electrical controls. Work ranges are from 36" x 36" to 94" x 84". All sizes available with either two-way or four-way beds, and feature high and low speed ranges to a single spindle. *Available with automatic power positioning dial indicators for repetitive, close tolerance work.*

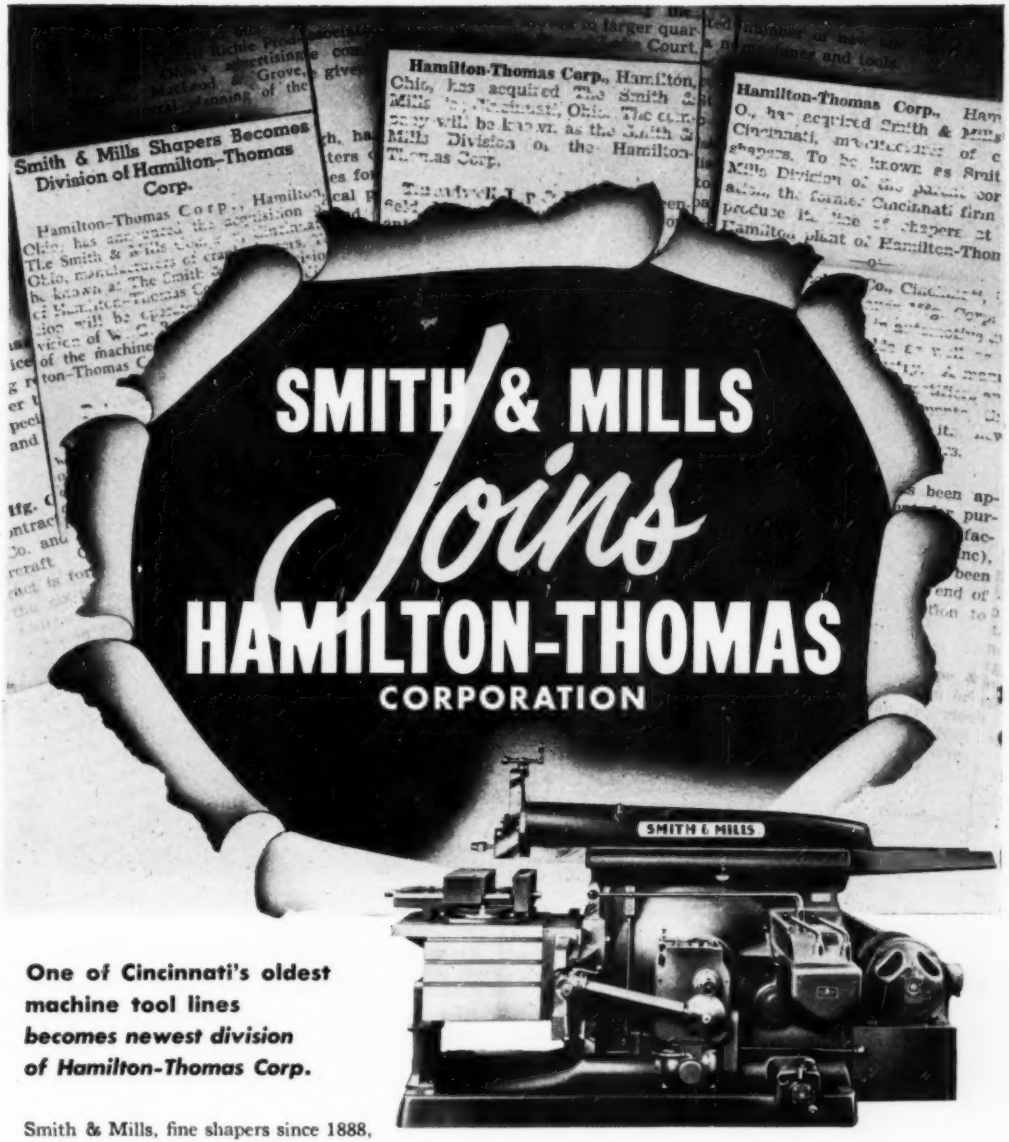
Write for descriptive literature.

LUCAS OF CLEVELAND

LUCAS

Precision

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO


Smith & Mills Shapers Becomes Division of Hamilton-Thomas Corp.
Hamilton-Thomas Corp., Hamilton, Ohio, has acquired the Smith & Mills Division of the Hamilton-Thomas Corp.
SMITH & MILLS
Joins
HAMILTON-THOMAS
CORPORATION
SMITH & MILLS

One of Cincinnati's oldest machine tool lines *becomes newest division of Hamilton-Thomas Corp.*

Smith & Mills, fine shapers since 1888, are now part of a new, progressive company, Hamilton-Thomas Corp., makers of Liberty Planers, Economy Pumps and Klipfel Valves. Smith & Mills is a welcome addition to a company that's been tool minded since its foundation . . . and has the facilities plus the engineering know-how to keep Smith & Mills Shapers among the first names in machine tools.

Do you have the latest Smith & Mills catalog in your file? Write Dept. AM-10 for your copy.

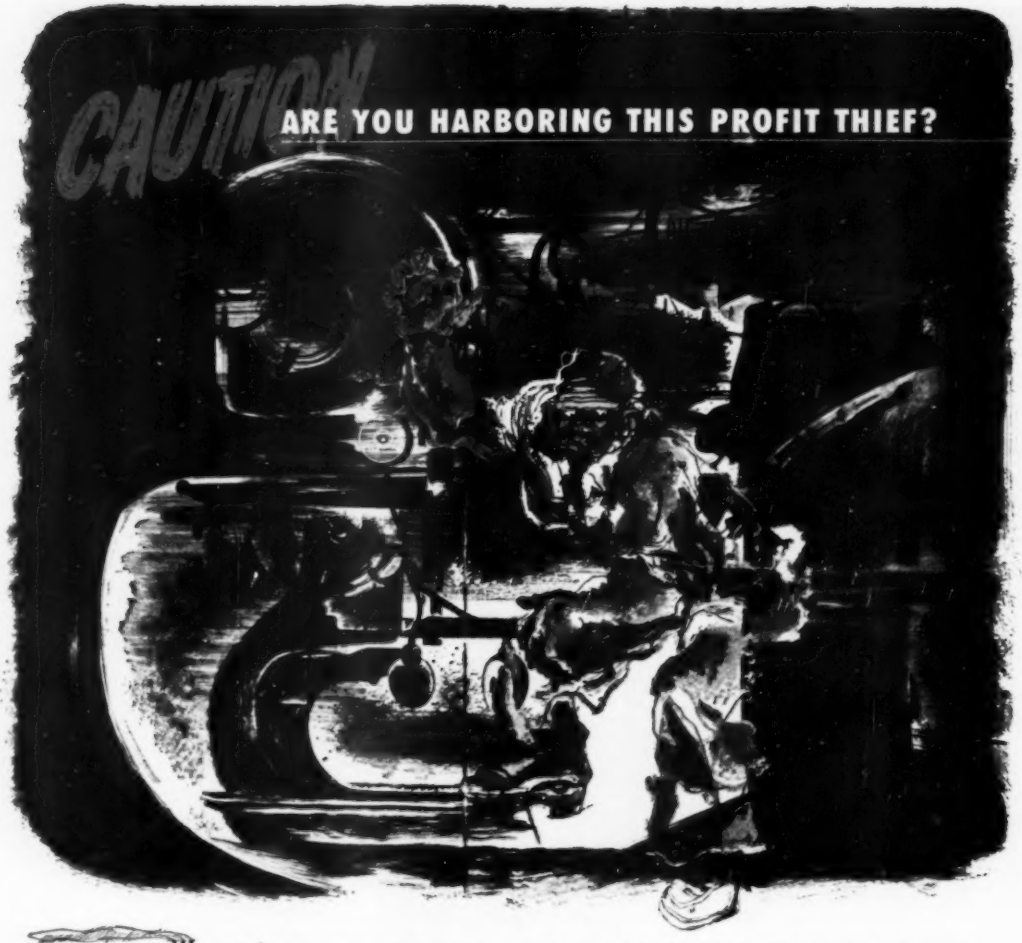
SMITH & MILLS SHAPERS, INC.

Division of Hamilton-Thomas Corp.

HAMILTON, OHIO

CAUTION

ARE YOU HARBORING THIS PROFIT THIEF?



He's as sly and treacherous as a trained saboteur—robbing and stealing valuable production from thousands of machines in thousands of plants. His total "take" is tremendous—but he *can* be stopped!

Even though you may think he's not at work in *your* plant, it will pay you to be suspicious enough to make *sure*—for he's often well disguised.

HERE ARE SOME *QUICK CLUES*

Are you still using out-dated "paddle" methods to fill grease guns in your plant? There's a masked bandit!

You can save 3¼ man hours for every 100 lbs. of grease and eliminate contamination risks, too.

Are you depending on "hand and muscle" for machine lubrication—with manpower costs 'way out of line and hit-or-miss maintenance? That's sabotage, too!

There is a way you can save up to 23.9 man hours in the application of every 100 lbs. of grease!

Have you ever measured your losses from "downtime" on machines due to bearing failure caused by faulty lubrication? Or have you ever figured the cost of "time-out" for lubrication? More thievery!

You can lubricate hundreds of bearings from one central point, with the right grease in the correct amount—while the machine continues to produce.

Have you got a clue that there may be a production thief in your plant—masked as faulty, old-time, hit-or-miss lubrication methods?

THERE IS A WAY TO STOP THESE LOSSES

An Alemite representative can tell you in 10 minutes how Alemite Methods will simplify and better organize your lubrication procedures. He can show you how mechanized lubrication from "barrel-to-bearing" will increase your production and profits.

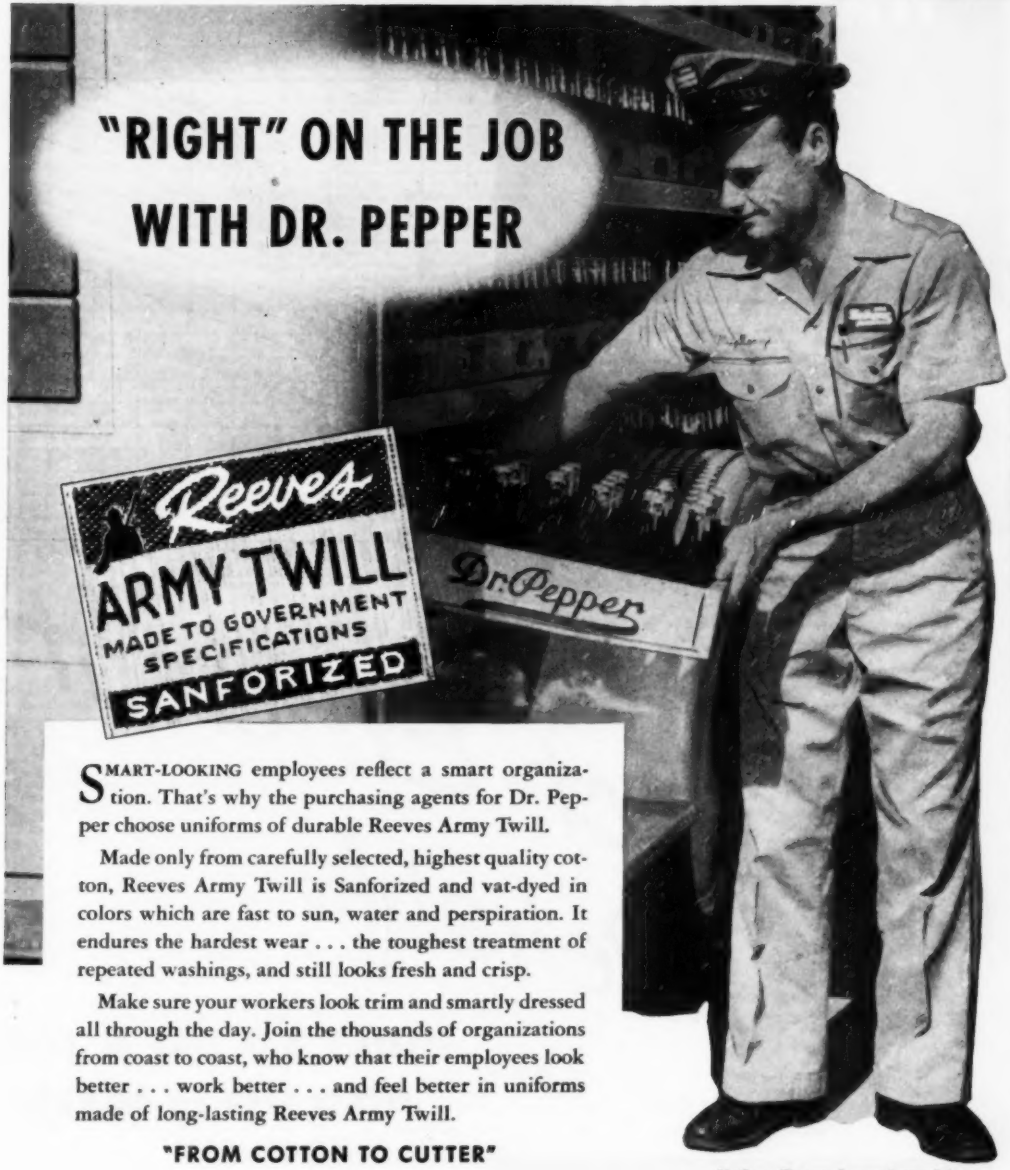
Call your Alemite Distributor on the phone. Or write to Alemite, 1899 Diversey Parkway, Chicago 14, Illinois.

ALEMITE

MODERN LUBRICATION METHODS THAT CUT PRODUCTION COSTS

Division Product of STEWART WARNER

REEVES ARMY TWILL



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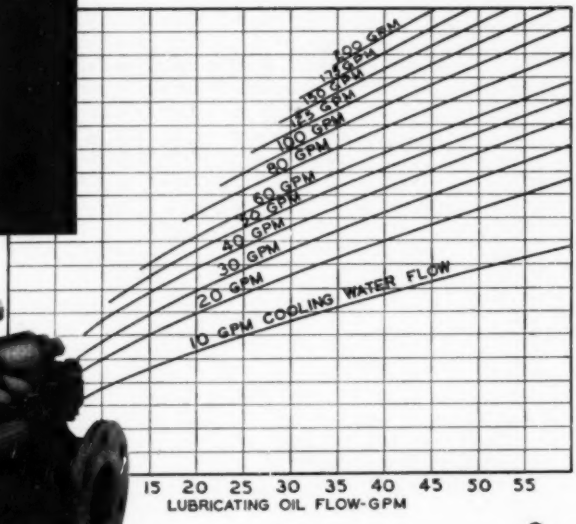

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FREE LITERATURE

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 SHAPERS—*Cincinnati Shaper Co., Cincinnati 25, Ohio.* 32-page illustrated catalog contains complete specification and data on shapers. Sample applications of the machines are shown, as are special attachments and equipment which can be added. Catalog No. N-5A.

2 MACHINE TOOLS—*Atlas Press Co., Kalamazoo, Mich.* Six catalogs ranging in size from 6 to 16 pages cover shapers, a quick-change 10-in. lathe, milling machines, drillpresses, floor saws, and bench saws. Illustrations and descriptive material cover the machines themselves and various accessories. Price lists are included. Catalogs No. S48, M48, D48, F548, and 8-10S.

3 JIG BORER—*The Fosdick Machine Tool Co., Cincinnati 23, Ohio.* 24-page catalog illustrated with color presents jig borer with two alternate tables and accessories. Reamers, parallel bars, spotting tools, stub gages, collets, a center finder, and a universal toolhead are described, and specifications on the complete machine are included. Catalog No. 16.

4 INTERNAL GRINDERS—*The Heald Machine Co., Worcester 6, Mass.* 76-page instructions book for Models 271 and 272 Size-Matic and Gage-Matic grinders has information on installation, lubrication, set-up, trouble shooting, hydraulic system, capacity, wheelheads, and service repair. The book includes many clear drawings of machine parts and accessories.

5 MACHINE TOOLS—*Walker-Turner Div., Kearney & Trecker Corp., Plainfield, N. J.* 16-page catalog illustrates small tools for working both metal and wood. Included are a 12-inch bandsaw, a 6-in. jointer, an 8-in. tilting table saw, and a 9-in. tilting arbor saw. Catalog B.

6 DUPLICATORS—*O'Neil-Irwin Mfg. Co., Lake City, Minn.* 40-page catalog describes Di-acro system of die-less duplicating with such machines as rod parters, precision benders, shears, punches, notchers, forming machines, and brakes.

7 CUTTER GRINDERS—*Gallmeyer & Livingston Co., Grand Rapids 2, Mich.* 16-page bulletin shows Grand Rapids Nos. 4 and 5 universal cutter and tool grinders. Illustrations of grinding set-ups for cutters, reamers, hobs, and gears are included. Bulletin GL-1-49.

8 MACHINING FACILITIES — *The Bunell Machine & Tool Co., Cleveland 14, Ohio.* 36-page catalog includes photographs of products manufactured as well as departments, machines, and facilities available in the plant. A complete listing of various machine equipment is given. Design engineering and testing services are available.

9 JIG MILLER—*DeVlieg Machine Co., Ferndale 20, Detroit, Mich.* 20-page illustrated booklet shows *Jigmil* precision boring and milling machines with 3- and 4-in. bars. Specifications and detailed information and illustrations on controls and operating devices, as well as accessories, are included. A micro-bore tool is described.

10 TOOL GRINDER—*Gallmeyer & Livingston Co., Grand Rapids, Mich.* 22-page booklet on hydraulic feed, universal and tool grinders Nos. 70 and 80 has complete descriptions and specifications, and many illustrations of setups for routine grinding jobs. Two large surface grinders are also illustrated. Bulletin GL-11-48.

11 FINISHING EQUIPMENT—*Almco Div., Queen Stove Works, Inc., Albert Lea, Minn.* 16-page booklet describes Supersheen equipment for precision deburring and finishing. Tumbling barrels, chips and compounds, hoist units, and other accessories are described, and sample finished parts are illustrated.

12 DIE CUSHIONS—*E. W. Bliss Co., Detroit 2, Mich.* 56-page illustrated reference manual on the general uses, advantages, and maintenance of press-die cushions and allied equipment. Includes detail descriptions, dimension tables and maintenance procedure for pneumatic and hydropneumatic die cushions. Locking devices, controls, overload relief beds, regulator valves, piping installations, limit switches, toggle links and die slides are described.

13 TOOLS AND FIXTURES—*Zagar Tool, Inc., Cleveland 23, Ohio.* 32-page brochure includes illustrations, drawings and data on indexing fixtures, holding fixture, lathe, chucks and collets, drilling heads, broaching machines, and keyway adapters. Price list is also included. Catalog No. 10.

TOOLS AND ACCESSORIES

14 SHOP TOOLS—*Warner Electric Co. Inc., Chicago 16, Ill.* 42-page complete catalog lists hand tools, drill guns, power saws, electroplating equipment, buffers and other small-shop equipment. Prices are included with illustrations and descriptions of all items. Catalog D.

15 CLAMPS—*Morton Machine Works, Ferndale 20, Mich.* 72-page catalog illustrates line of jack locks, fixture clamps, and standard details. A new fixture clamp for locking a casting through the bored hole onto a pilot plate is featured. Photos, diagrams, and specifications with a price list are included.

16 CUTTERS—*Goddard and Goddard Co., Detroit 23, Mich.* 12-page catalog of carbide tipped inserted blade cutters lists shank and shell and straddle and face mills for steel and aluminum. Engineering data and milling practice pointers are added. Bulletin No. 115 A.

17 DIE SETS—*Standard Die Set Manufacturers, Inc., Providence 7, R.I.* 24-page bulletin lists two-post, four-post and special steel die sets with drawings and dimension tables. Also listed are guide posts, punch shanks, bushings, setscrews, knockouts and dowel pins.

18 TRIMMING DIES—*The Steel Products Engineering Co., Springfield, Ohio.* 12-page bulletin lists Brehm dies for flat-edge trimming and notching of drawn shells. Diagrams and text explain how the trimming operation works.

19 MIDGET MILLS—*Severance Tool Industries, Inc., Saginaw, Mich.* 32-page catalog presents illustrations and information on midget mills, deburring mills, tube mills, countersinkers, and miscellaneous parts like edging mills, shanks, hand files, and carbide files. Catalog No. 17.

20 TURRETS — *Ruco Manufacturing Co., Chicago 39, Ill.* 16-page catalog lists square turret toolposts for a cross-slide or a compound replacement. Heavy duty and cam-locking turrets are listed, as are a hex turret and tailstock turrets. Catalog No. 48.

21 ELECTRICAL ACCESSORIES—*Haiub Industries, Inc., Sycamore, Ill.* 10 bound bulletin sheets list bakelite and porcelain wire connectors, fuses, accessories, wire strippers, screw anchors, industrial cleaners, and allied centers and inserts.

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22 GRINDER—*R. G. Haskins Co., Chicago 12, Ill.* 4-page bulletin describes Model VB 2 high-speed grinder for small wheels and quills. Cutters, grinders, and sanding drums with shanks of 8 in. and ¼ in. diameters are listed.

WELDING AND HEAT-TREATING

23 GRADIATION HEATING—*Solar Corporation of America, Philadelphia 34, Pa.* 78-page booklet with color diagrams explains gradiation process for speed-heating of metals. The illustrated descriptive text is a second edition of a 1947 booklet for a selected distribution, and discusses heating, reheating, and surface heating at mill or shop speeds for better metallurgical results.

24 HEAT-TREATMENT—*Cooley Electric Mfg. Corp., Indianapolis 7, Ind.* Booklet: "Shop Notes on Heat-Treating of Steels" discusses typical heat-treating procedures and tips for better heat-treating in non-technical manner for shops without trained metallurgists.

25 GAS CUTTING—*Air Reduction Sales Co., New York 17, N.Y.* 12-page descriptive folder covers two pantograph gas-cutting machines, with a list of distinctive features, illustrations of the machines at work, and information on tracing devices.

26 ARC WELDING—*General Electric Co., Schenectady 5, N.Y.* 20-page catalog has descriptions, specifications, and prices on over 150 arc-welding accessories. Such items as electrode holders, helmets and goggles, tungsten electrodes, protective aids and clothing, electrode carriers, connectors, brushes, cleaning tools, and fillet-weld gages are covered. Catalog GEC-253A.

PLANT SERVICE EQUIPMENT

27 OVERHEAD CRANES—*The Electric Overhead Crane Institute, New York, N.Y.* 16-page booklet establishes specifications and general information for standard industrial service electric overhead traveling-cranes manufactured by the member companies. General specifications in paragraph form are followed by trolley, bridge, girder, electrical, and sample specifications. Appendix suggests runway rail sizes, crane operating speeds, and arrangement of controllers.

28 INDUSTRIAL VISION—*American Optical Co., Southbridge, Mass.* 24-page booklet, "Improved Industrial Vision" explains the need for improving industrial visual efficiency and offers a program for lowered cost, increased safety, and improved production.

29 COMPRESSORS—*Gast Mfg. Corp., Benton Harbor 2, Mich.* 8-page condensed catalog lists rotary air motors, compressors, and vacuum pumps for original equipment. A price list is included with information on the products and illustrations. Bulletin 549.

30 BELT CONVEYORS—*Lippman Engineering Works, Milwaukee 14, Wis.* 32-page bulletin presents information on stationary, portable and 16 types of special purpose belt conveyors, both troughed and flat. Dimensions, weights, and specifications for standard sections are added. Bulletin 1400.

31 FELT—*Western Felt Works, Chicago 23, Ill.* 18-page booklet on vibration-absorbing felt analyzes typical vibration problems with photographs and charts.

32 FILTERS—*Titeflex Inc., Newark 5, N.J.* 12-page folder describes industrial and laboratory filters, membranes, and chamber units. Some insulations are depicted in photographs.

PARTS AND MATERIALS

33 CUTTING OIL—*F. E. Anderson Oil Co., Portland, Conn.* 12-page performance report by a user of Lusol cutting fluids is based on test run of 833 forged steel valve bonnets for 1 in., 600 lb., inside screw globe valves. Comprehensive charts compare tool life, cutting-speeds, and costs when using Lusol against previous cutting-fluid practices. Report 749.

34 SOLUBLE OILS—*D. A. Stuart Oil Co., Chicago, Ill.* 20-page pocket-size booklet describes applications, performance, handling, and advantages of soluble oils for lubrication and cutting.

35 AIR LINES—*Aeroquip Corp., Jackson, Mich.* 52-page catalog lists couplings, hose fittings, flanges, hoses, assemblies, and accessories. Engineering data, assembly instructions, and installation aids are contained in the manual. Catalog No. 200.

36 CLEVIS JOINT—*Midland Mechanical Developments, Ltd., Birmingham 16, England.* Four-page folder shows, with photographs and drawings, a spring-loaded Clevis joint and manufactured in England, available in this country.

37 PULLEYS—*Gerbing Mfg. Corp., Chicago 6, Ill.* 18-page bulletin illustrates Roto-Cone variable-speed pulleys. General dimensions, diagrams, and information on adjustable motor bases and wide V-belt sheaves are presented. Catalog No. 649.

38 SCREWS—*United Screw and Bolt Corp., Chicago 8, Ill.* 12-page bulletin features clutch-head screws and screwdrivers giving dimension and specification information.

39 ALLOY STEEL—*Joseph T. Ryerson & Son, Inc., Chicago, Ill.* 24-page booklet contains information on steel processing including the Jominy test, quench and hardenability test, and other tests. Available alloy steels are listed.

40 BEARING BALLS—*Pioneer Steel Ball Inc., Unionville, Conn.* One-page data sheet contains statistical data on bronze and stainless-steel bearing balls in sizes from 3/32 in. to ¾ in.

41 TUBE FITTINGS—*The Parker Appliance Co., Cleveland, Ohio.* 60-page catalog lists design data, specifications, materials, and general dimensional data for each of four fitting types for a hydraulic and fluid-handling system. Tubing and tube-fabricating equipment is also illustrated and described. Catalog No. 203.

42 CASTINGS—*Meehanite Metal Corp., New Rochelle, N.Y.* 4-page bulletin contains tabular summary of engineering properties of various Meehanite castings available to industry. Property changes as affected by vibrations are covered by additional information. Bulletin No. 32.

43 VIBRATION ISOLATORS—*Finn & Co., New York 30, N.Y.* 24-page catalog features up-to-date information in charts, illustrations, and text concerning vibration isolation.

44 MERCURY SWITCHES—*Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Philadelphia 44, Pa.* 16-page catalog lists mercury switches by means of tables with engineering data and small illustrations of each type. Manufacturing steps involved in making the switches are depicted in a series of photographs, which also show typical switch applications. Catalog No. 1343.

45 VALVES—*Ross Operating Valve Co., Detroit 3, Mich.* 8-page illustrated bulletin on In-Line master valves and pilot valves depicts valves designed for faster machine speeds and reduced operating costs.

46 STEEL TUBING—*J. Bishop and Co. Platinum Works, Malvern, Pa.* 8-page bulletin presents specifications on cold-drawn stainless-steel tubing with outside diameters from 0.008 in. to 1 in. A chart of wall-thickness proportions, a listing of steel types and alloy contents, and a chart of physical properties are included with other descriptive material.

MISCELLANEOUS

47 TOOL CONTROL—*McCaskey Register Co., Alliance, Ohio.* 12-page booklet describes how tool costs were cut 12 ways in 20 plants with tool crib control. Suitable cartoons illustrate the brochure.

48 RESEARCH—*The Franklin Institute of the State of Pennsylvania, Philadelphia 3, Pa.* 40-page brochure describes expanded facilities for research and development in such fields as solid state physics, metallurgy, optics, radiation, friction, measurement and control, magnetic clutches, machine design and unusual machines.

49 MECHANICAL MANUFACTURING—*General Mills, Inc., Mechanical Div., Minneapolis 13, Minn.* 12-page booklet describes mechanical equipment and machine tool facilities for manufacturing purposes. All of the machine tools which are available are listed.

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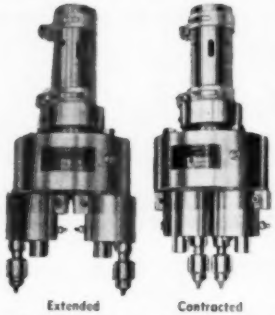

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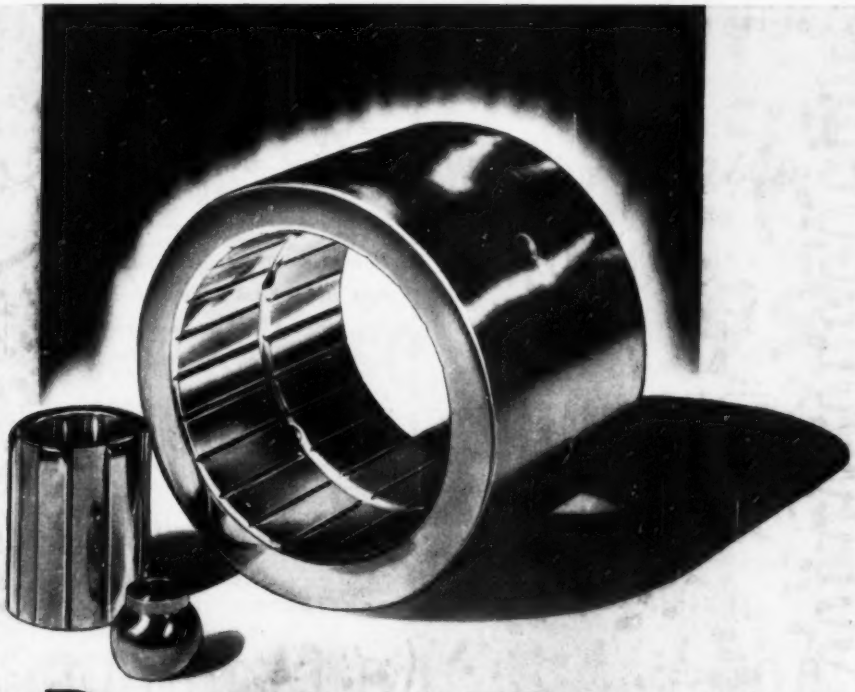

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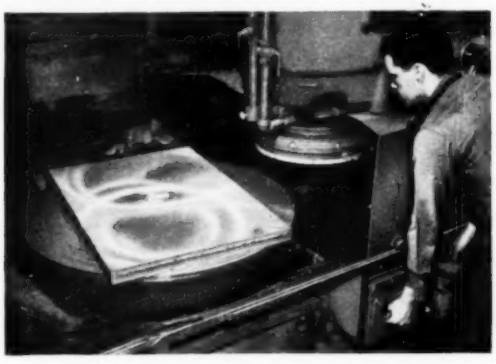

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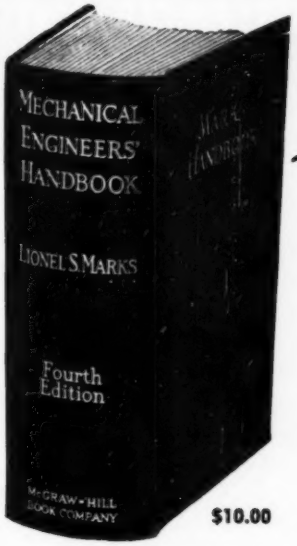

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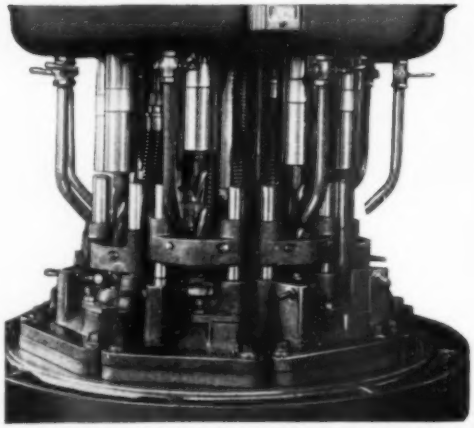

DRILLING 1" DIA. HOLE IN TWO TYPES OF PARTS AT 960 PER HOUR

Two types of bicycle handle bar stems are machined on this Model 8SV vertical drilling machine. The illustration above shows fixture design for holding both types of parts. The hole drilled is 1¼" deep, partially cored, and 1" deep. Parts are drilled at the rate of 960 per hour in a machine with a base only 6 ft. in diameter. Here's why production like this is possible:

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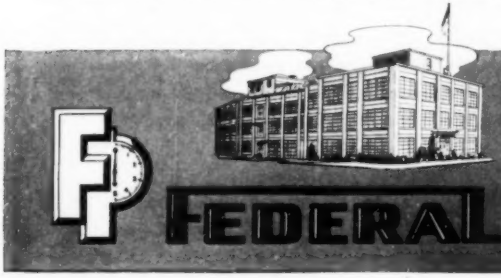

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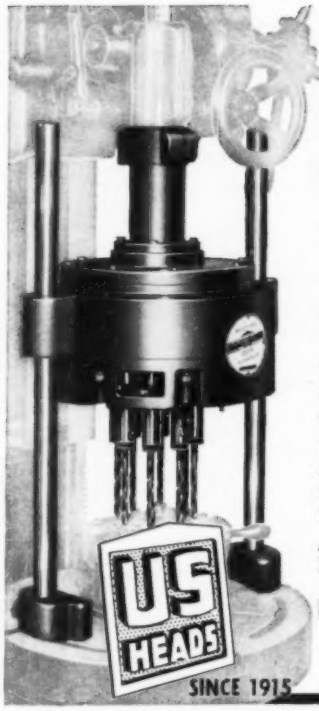

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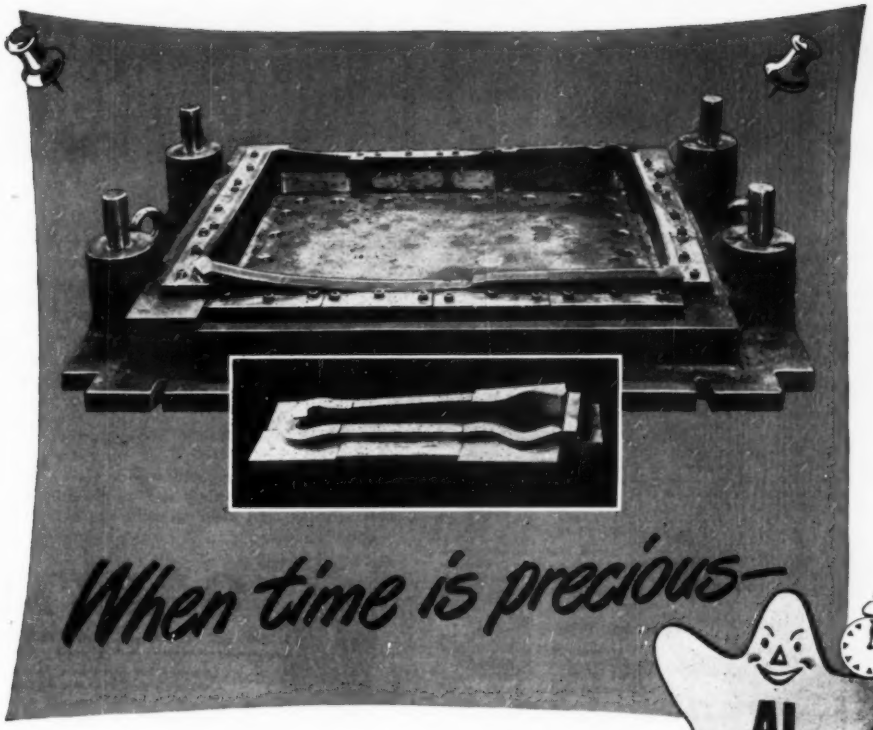

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As knurled knob of Vlier Torque Thumb Screw is turned, torque is applied which is transmitted to screw, until prescribed resistance is developed. At this point, ball in head construction as shown, is depressed into cavity and the applied torque to screw ceases and no further pressure can be applied. "Tight is tight enough."

INVERTED TYPE B

This type is ideal for use where space is limited. Work is supported on end opposite screw section which now fits into tapped hole in fixture base.

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This torque thumb screw is designed for use with sliding Vee Blocks. It offers the correct solution against springing castings or forgings with protruding arms. No forcing castings, etc., out of place while machining. Ideal for distortion-less clamping with accuracy assured.

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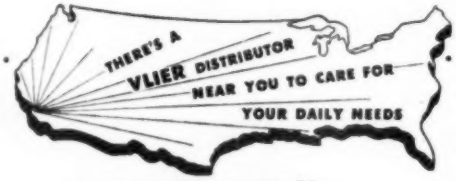
In addition to the Vlier Torque Thumb Screws which provide established end pressures, this latest adjustable type provides a torque thumb screw which tool engineers can set themselves to obtain end pressure they desire from 5 to 50 lbs.



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Cutting-Shaving-Checking-Lapping
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New Production Line Gear Shaver For Heavy Duty Gears

Designed as a PRODUCTION machine, the new Michigan Model 873 rotary gear shaver (Fig. 1) brings to the finishing of heavy duty gears the ability to turn out such gears faster, more accurately and at lower cost. Completely automatic in operation, the 873 will handle spur or helical gears and involute splines of from zero (with 10″ cutter or larger) to 18 or 24 in. diameter, and with face widths ranging up to 15 in. Once the machine is set up for a given gear type, it is necessary only to load the gear between centers and push a 'start' button to complete the entire operation.

Features of the new Michigan 873 include ability to shave gears by any of three methods—

1. UNDERPASS—(Fig. 2) tangential feed; one roughing and one finishing pass usually enough for any gear (up to 4″ face). For finishing close shoulder gears, etc.; evenly distributed cutter wear.
2. TRAVERPASS—(Fig. 3) combined tangential and axial feed of the cutter. Evenly distributed cutter wear; cutters narrower than underpass. (Gears up to 5″ face)
3. TRANSVERSE—(Fig. 4) infeed; rapid approach plus a slower intermittent infeed. For finishing widest face gears (up to 15″ face) with narrow cutters.

Curve Shaving. Ability to curve-shave (crown) either narrow or wide face gears by any of the above three methods. Adjustable power-driven sine-bar mechanism rocks the work table about a center pivot for transverse and some traverpass shaving. Others curve-shaved by use of reverse-crowned cutters.

Floor Space. Greatly reduced compared with previous machines designed for handling large gears.

Controls. All controls located at front of machine.

Faster Cutting, due to inclusion of a 'rapid approach' feed in the machine cycle, and automatic in-and-return feed.

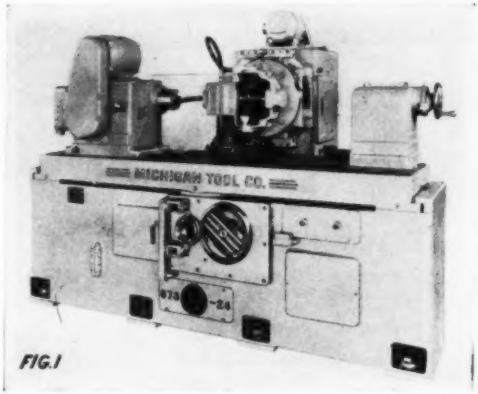


FIG. 1

Internal Gears. Special interchangeable cutter head provides for finishing internal gears on the 873.

Adjustments of the 873 have been kept simple for fast setup. Crossed axis setting is speeded by adding a five ten-thousandths indicator to the conventional vernier arrangement. Any of the three shaving methods may be selected by rotating the slide for the cutter head into proper position, mounting the correct cutter, adjusting center distance (by hand wheel at front of machine), and setting machine cycle. Limit switches regulate cutter reciprocation and head infeed.

Specifically designed for production line operation, the machine enables the use of unskilled or semi-skilled operators, further reducing costs. The operator merely loads the gear between centers and starts the machine by pushing a button. At the end of the complete machine cycle, the operator merely reloads. Machines are so designed that an overhead crane or hoist can be used to lower heavy gears directly between the centers.

For further information on the new 873 gear shaver, ask for Bulletin No. 873-49.

FIG. 2

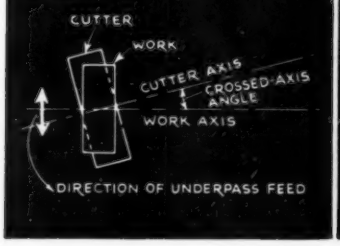


FIG. 3

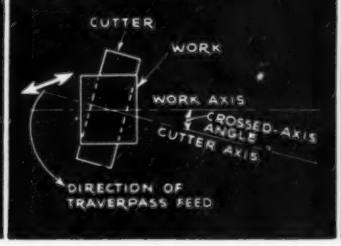
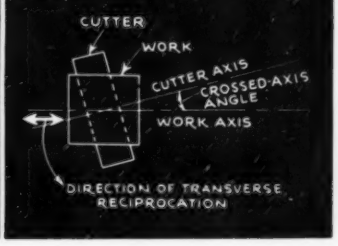


FIG. 4



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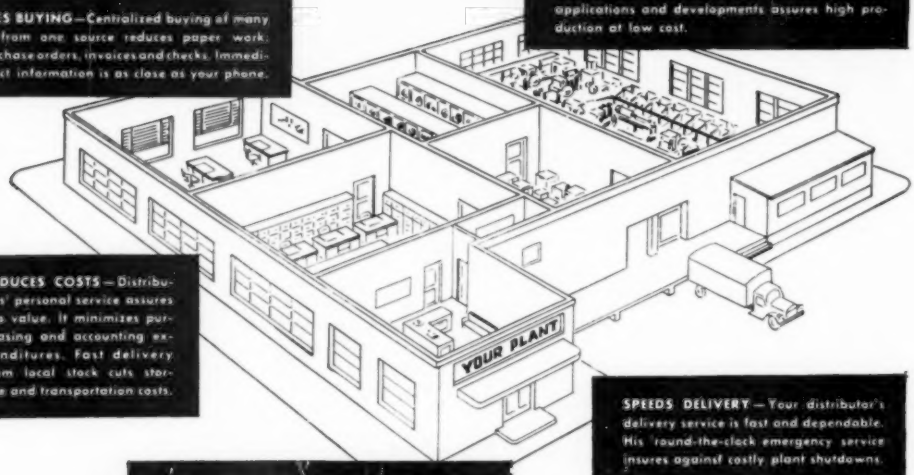

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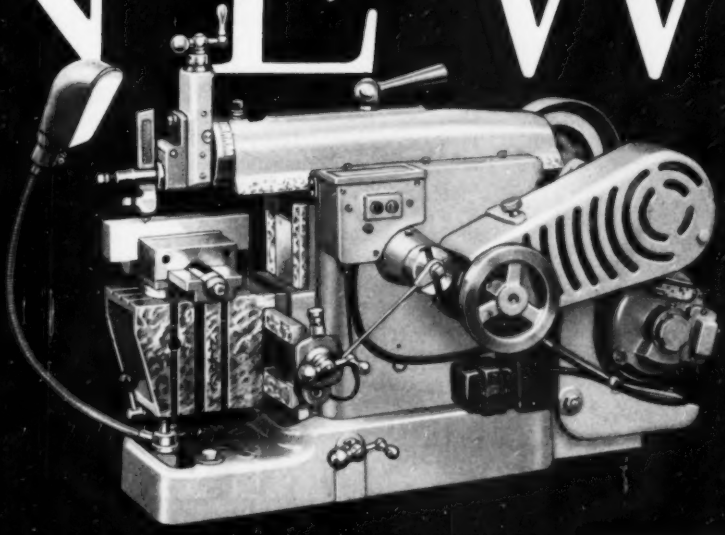

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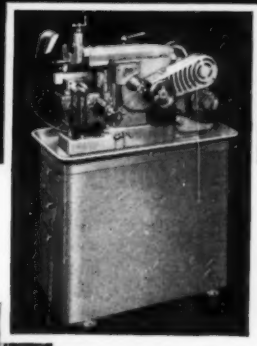

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The South Bend 7" Bench Shaper has been designed as a highly accurate, fast and rugged tool. It is especially suited for toolroom, production and maintenance work that requires close-tolerance machining of a wide variety of small jobs. Built to the same high standards of workmanship and performance as South Bend Precision Lathes, it can be depended on for economical metalworking. *Write for literature.*

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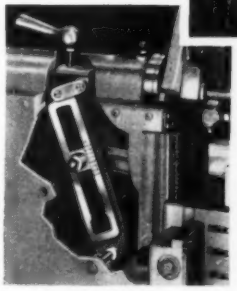

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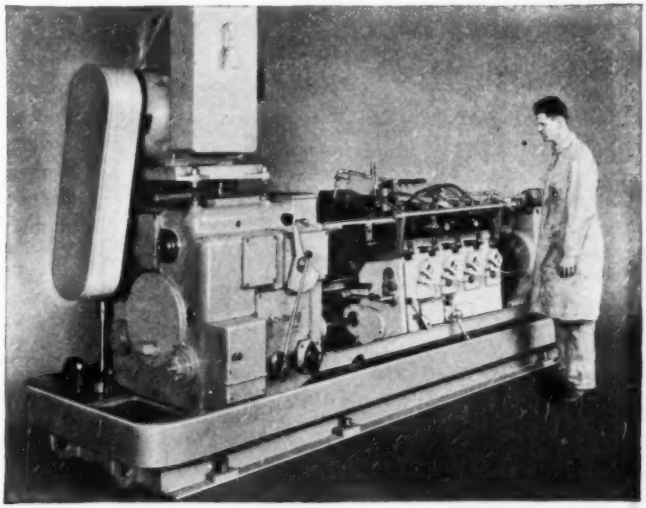

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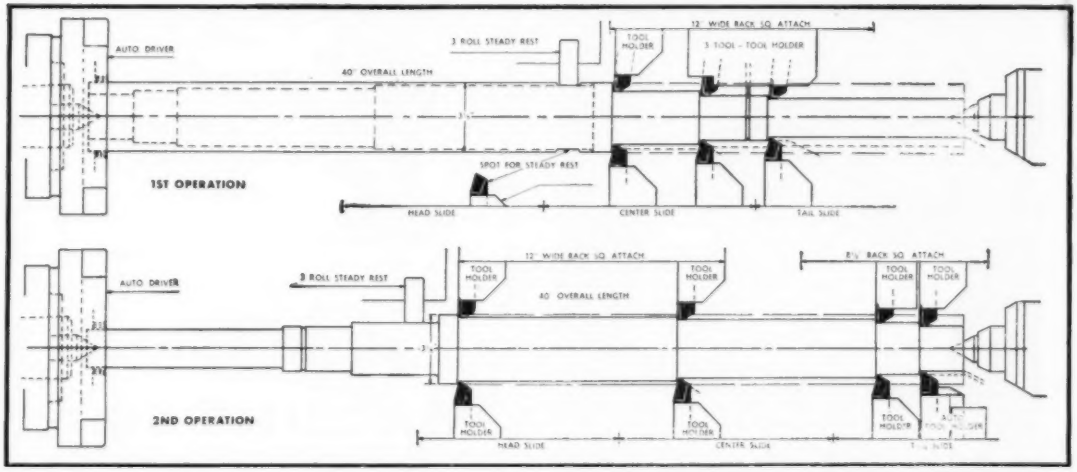

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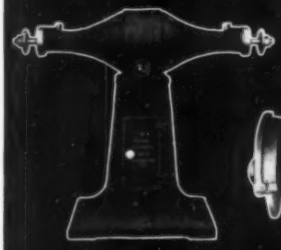

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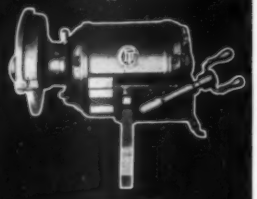

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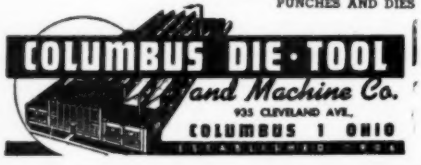

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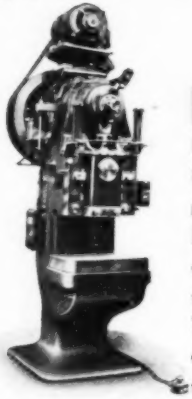

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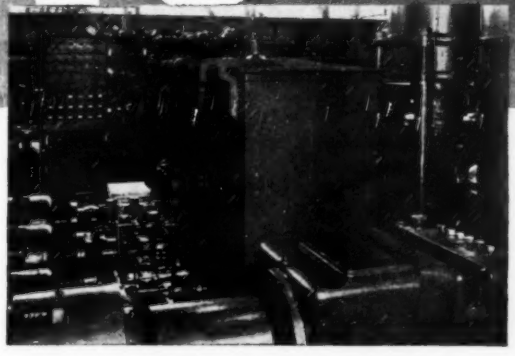

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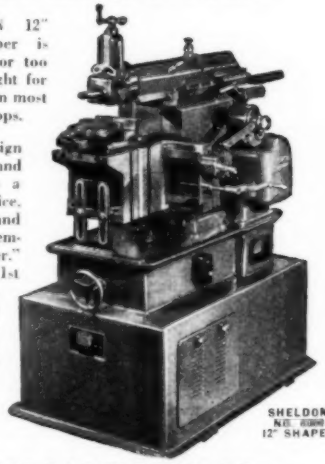

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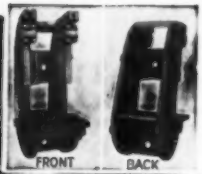

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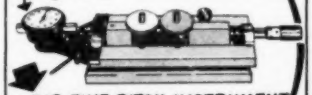

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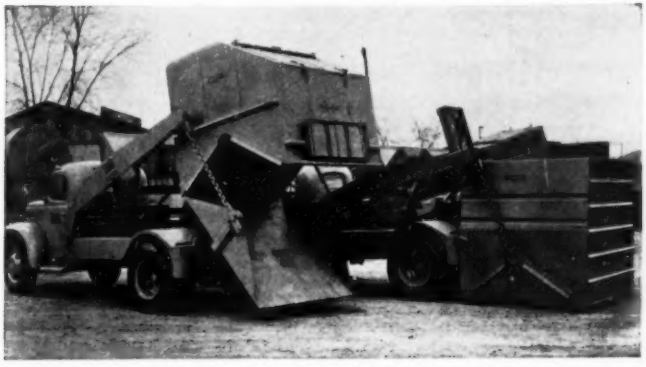

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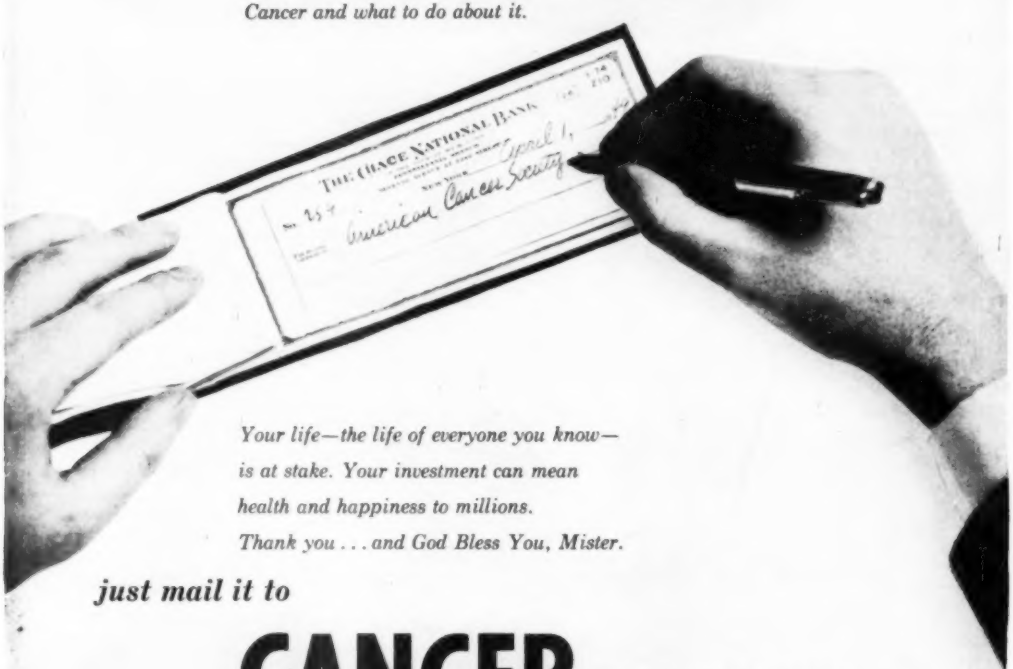

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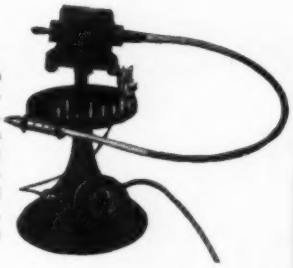

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY

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They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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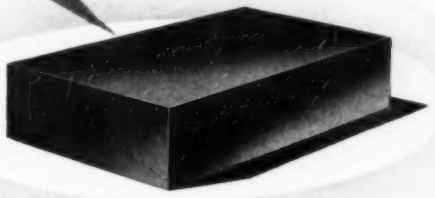
STUART *service goes with every barrel*

Carboloy announces . . . an improved grade 905



- More wear resistance
- Greater cutting edge strength
- Greater chipping resistance
- Greater cratering resistance
- No break-out of crater lip on longer runs
- Easy to grind
- Easy to braze
- No "special" feeds or speeds required
- Better heat conductivity—more rapidly dissipates heat at cutting edge
- Holds size with uniform land wear

For machining today's high tensile-strength cast iron

TOOL LIFE can be *doubled* when machining high tensile-strength cast iron with Carboloy's improved Grade 905! Equally improved tool life is possible on non-ferrous metals.

This improved carbide is a direct result of Carboloy's continuing policy of improving all grades to meet machining problems brought about by metallurgical developments. It brings production-increasing, money-saving performance to your machining jobs.

Here's proof

Carboloy's improved Grade 905 was used on a job involving the complete machining of 180-230 Brinnel cast-iron clutch pressure plate faces. Procedure was (1) rough facing—⅛" depth, .030" feed and SFPM of 215 to 355; and (2) finish facing—1/32" depth, .020" feed and 320 to 550 SFPM. On this job, competitive grades turned out 97 pieces per grind, *while Carboloy's improved Grade 905 turned out 149 pieces!*

Why not take advantage of the time, labor and money savings improved Grade 905 brings you? Specify it in your next order. Carboloy Company, Inc., 11149 E. 8 Mile Avenue, Detroit 32, Michigan.

Here's a case history of the amazing performance of Carboloy's improved Grade 905.

CASE X

Job: Precision-boring back bearing holes for crankshaft in cylinder blocks.

Material: Alloy cast iron.

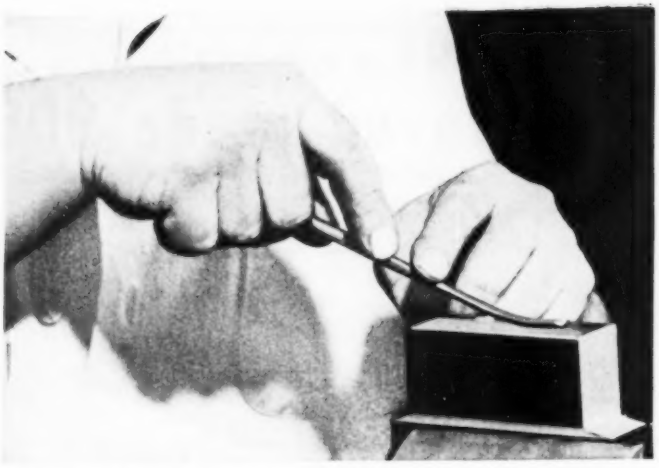
Bearings: 2¾" diam. bore, 2¾" long.

Depth of cut—.009" to .010"
Feed—.010"
SFPM—438

Competitive grade (Avg.) —1000 pieces per grind.

Improved Grade 905 (Avg.) —2000 pieces per grind.

CARBOLOY®
CEMENTED CARBIDE



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Increase Gear Production!

LAMBERT M75 STEPS UP PRODUCTION 50%

Ideal for the manufacture of precision gears with diameters from .07874 to 3.46456 inches (2 to 88 MM).

- **STRAIGHT TEETH GEARS**
- **HELICAL GEARS up to 18° R.H. or L.H.**
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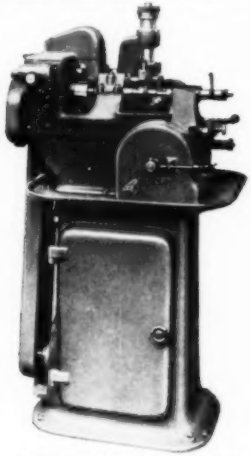
Automatic radial and longitudinal feed, combined in the M75, effect a shortened approach stroke . . . increasing productive capacity as much as 50%!



- **Cuts gears from 2 to 88 MM.**
- **Maximum Module—1.5**
- **Number of Teeth—4 to 390**
- **Speed of Hobs—214; 380; 550; 940 RPM.**
- **10 Feed Speeds—0.075-0.80 MM.**

Positive, automatic lubrication system for all working parts . . . Coolant pump with easy accessible swarf filter . . . Cutter spindle of solid construction, allows replacement of cutter arbor . . . Work spindle easily removed . . . Comes with deburring attachment; cam for radial hobbing of worm wheels; helical gear hobbing cam; gears for 10 feed speeds; gears for 4 hob driving speeds; etc. . . . Correcting mechanism for highest precision divided gears attachment for hobbing bevel gears; and extra index gears available as supplementary equipment.

Write for data on Model 75 and other Lambert gear hobbing machines.

LAMBERT DIVISION

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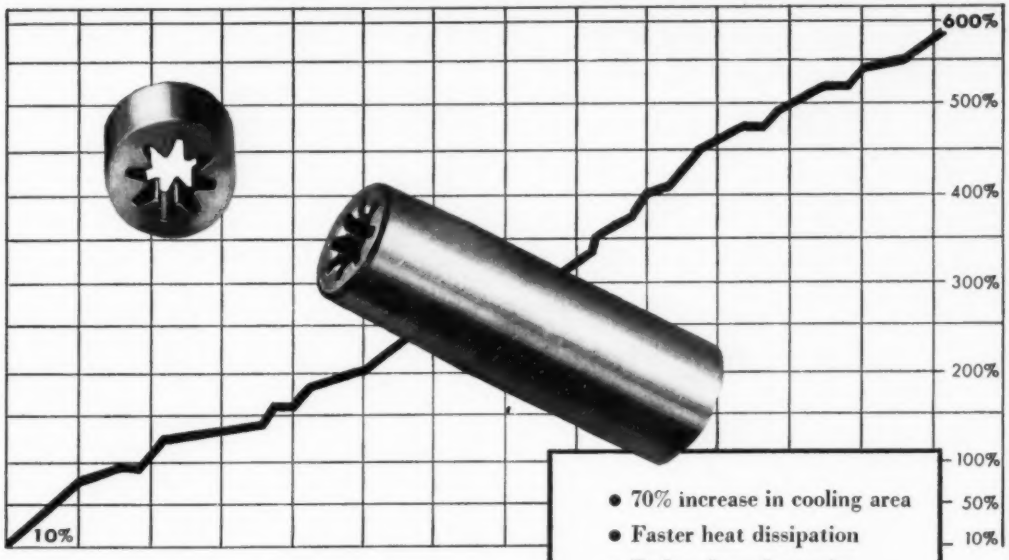

- 70% increase in cooling area
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Actual customer field experiences with the Mallory Fluted Tips have demonstrated life increases of from **10%** to **600%.**

Because of varying conditions, it is impossible to predict exactly how great an increase you can get in your shop . . . but since you pay no more for fluted tips, *any* increase in life means a reduction in your costs.

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ADAPTABLE TO MANY USES

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Office and factory furniture
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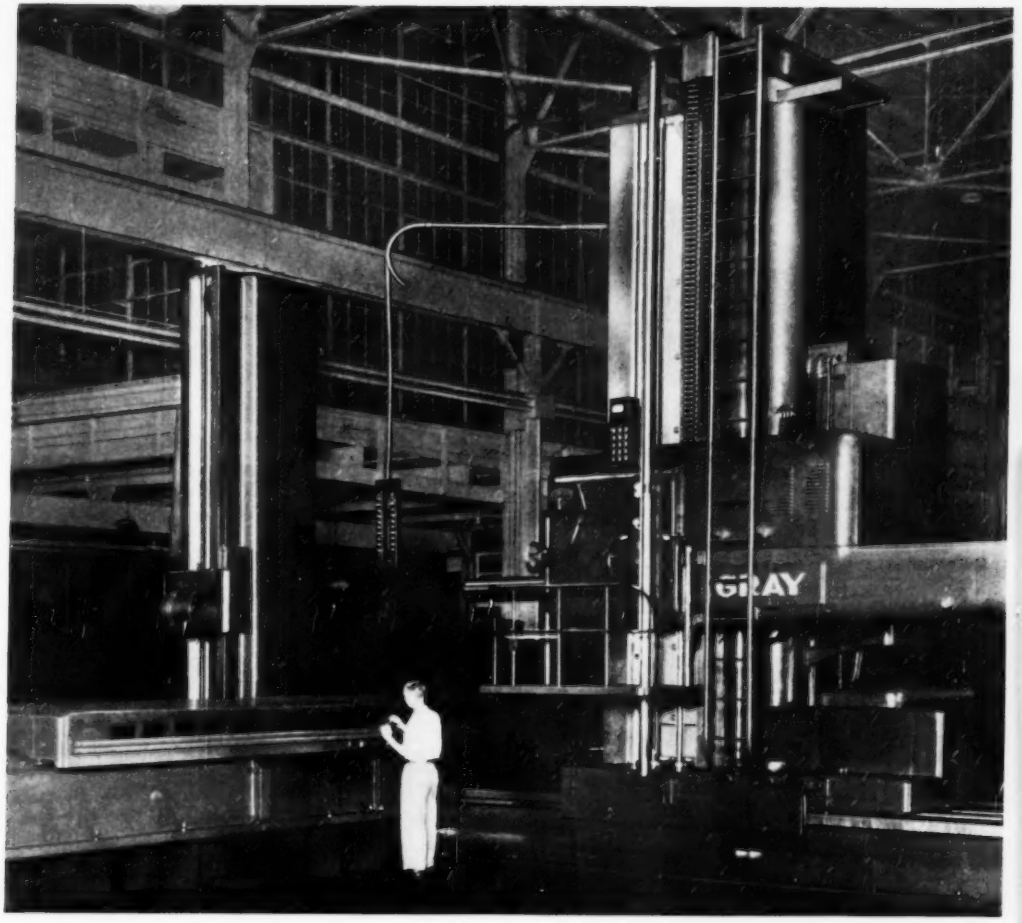


175 Ton—Precision GRAY 8" Boring Machine built for HYDRAULIC PRESS MFG. CO., Mt. Gilead, Ohio

This new Gray will machine 85 ton cast steel H.P.M. Press Components. A 75 h.p. spindle motor and anti-backlash table drive will facilitate heavy carbide milling. Any one of 24 spindle speeds are instantly available through the Gray insto-shift speed control. Feeds are independent of speeds and may be easily changed at the pendant station.

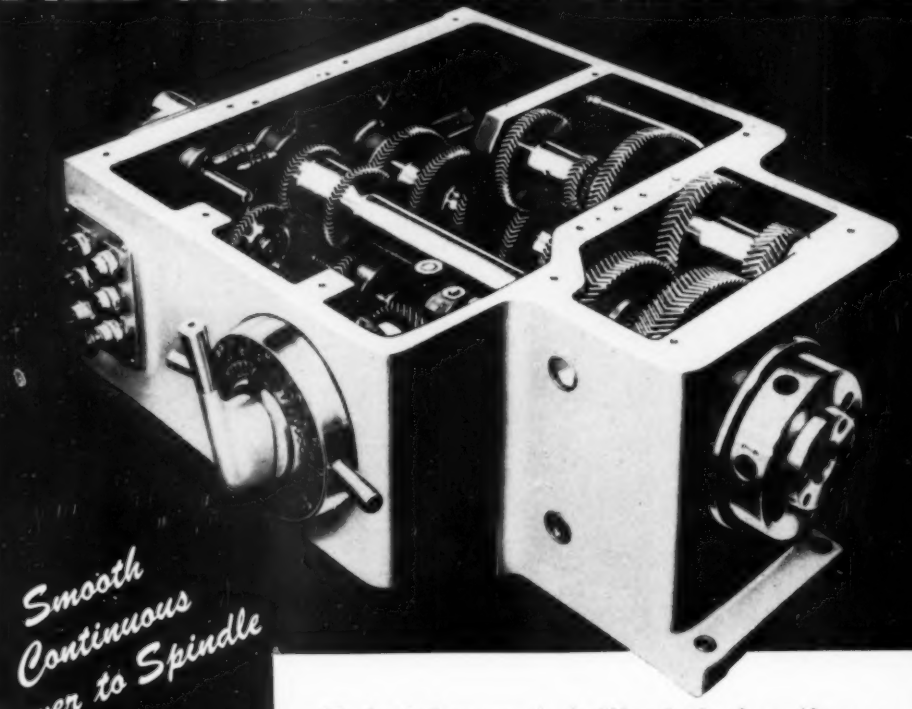
The table is 9' wide x 20' long and is supported on 2 vee and 2 flat bearings equipped with Gray non-metallic ways. The bar has 84" of continuous feed and 12' of vertical travel. The synchronized outboard arbor support has 12' of vertical travel and 3' cross adjustment. The column base is supported on 3 wide flat bearings equipped with Gray non-metallic ways and is provided with a bore aligning device which assures straight line column adjustment.

Extreme simplicity of control is outstanding — all clamps and clutches are automatic and power actuated. The Gray electric woodpecker permits positioning to accuracies of .00025".

Supplementary equipment includes a 60" continuous feed facing head, 48" right angle attachment and a 7' x 8' power rotary table.

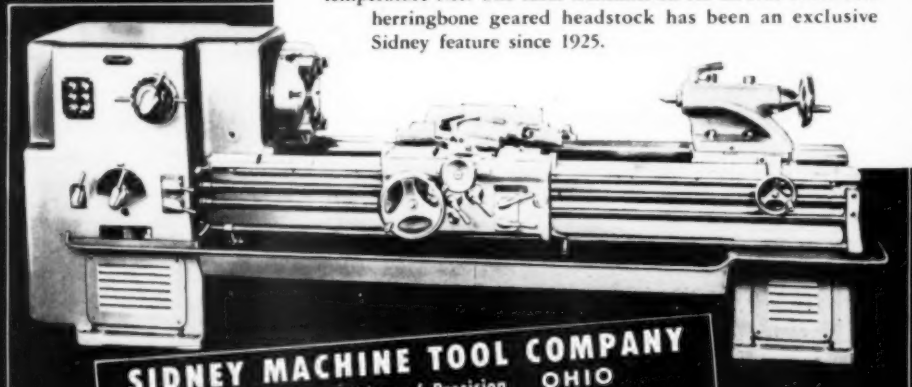
If your work is large or small you can machine better — faster — on a Gray.

SIDNEY'S 32 SPEED DIAL CONTROLLED HEADSTOCK



Smooth Continuous Power to Spindle

The herringbone gears in the Sidney headstock provide more tooth contact resulting in greater strength, smoother action with end thrust eliminated through the double opposed helix angles. Accurate tooth contour, gradual engagement and oblique lines of contact assure correct tooth action and reduces wear to minimum. This headstock also features a spindle mounting which automatically compensates for expansion caused by temperature rise. The ideal transmission for carbide tools. The herringbone geared headstock has been an exclusive Sidney feature since 1925.



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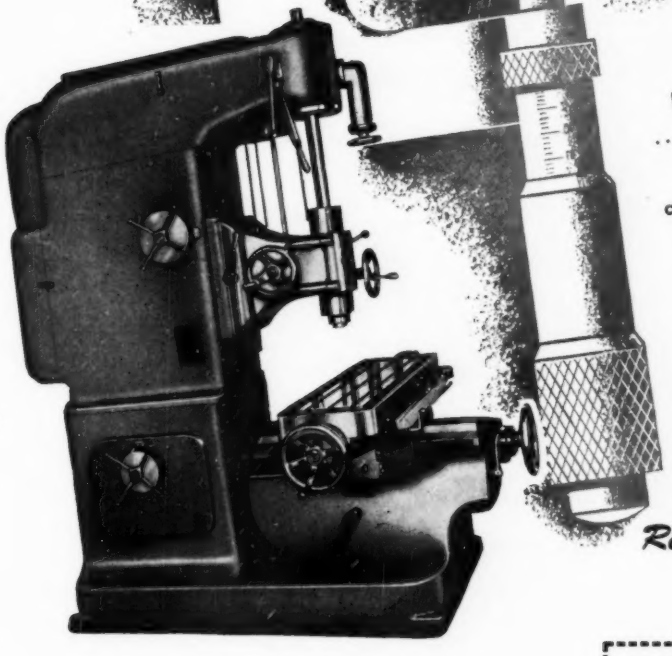
SIDNEY Builders of Precision Machinery Since 1904 OHIO

EXCEPTIONAL ACCURACY, SPEED AND POWER

No. 50 PRECISION BORING AND VERTICAL MILLING MACHINE

★ Reduces Set-Up Time To A Minimum
★ Eliminates Time-Wasting Work Transfers
★ Multiple Operation On A Single Machine
★ Greater Output At Lower Unit Cost



The No. 50 is a machine built for precision as well as speed . . . with unusual ability to handle an extreme range of different and difficult jobs. Simple and convenient to operate — ruggedly constructed for many years of tough, trouble-free service — the Knight Miller offers worthwhile savings in greater output, lower production costs and improved quality of work.

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Adjustable Blade REAMERS

You'll produce more pieces—better—in shorter time with McCrosky Adjustable Blade Reamers. Their heat toughened alloy steel bodies, the special heat treatment given the blades, and the ground threads on the bodies and adjusting collars, assure unsurpassed efficiency and accuracy.

McCrosky reamers cut freely without chatter. They avoid any tendency to "dig in," and produce absolutely round, accurately dimensioned holes. Blades can be released easily—and adjusted and reground quickly and accurately, saving time and increasing output.

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Bulletin No. 17-R { Gives full details Send for a copy

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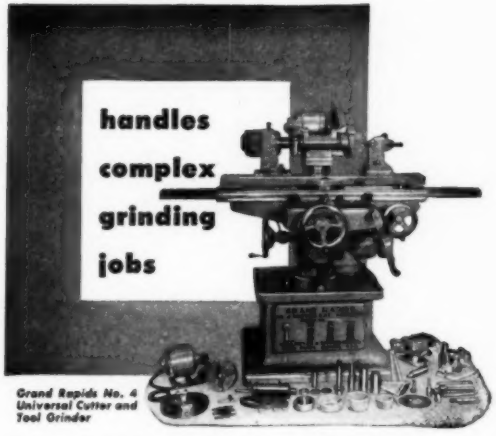
Adjustable BLADE REAMERS
Quick-Change CHUCKS
Turret TOOL POSTS
Block Type BORING BARS
SPECIAL *Multiple Operation* TOOLS



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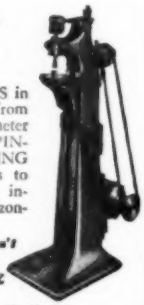

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. . . for precision work

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The cylindrical plungers in the Waltham Sub-presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

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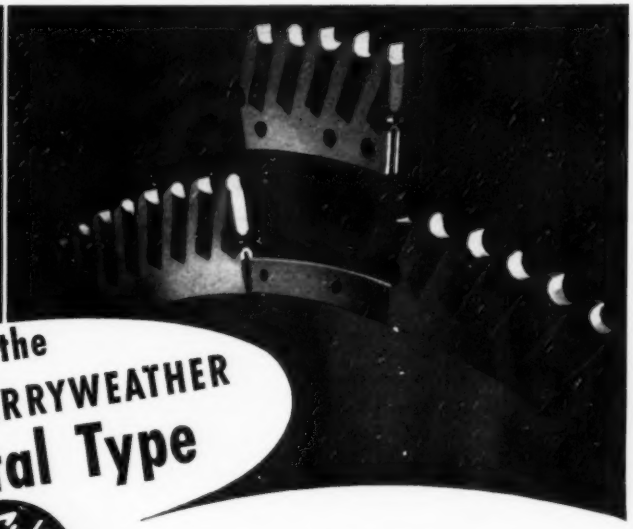
YOU CAN CUT OFF LARGE STOCK *More Cheaply, Quickly and Efficiently*



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Triple-Chip Saw Blade

M. & M.'s exclusive Triple-Chip grind gives unrivalled efficiency. Alternate high and low teeth form one and two curling chips, respectively ("Hi-Lo" principle).

Triple-Chip saw blades of the segmental type from 11" through 70" diameter are recommended by Motch & Merryweather for cutting larger stock, because they produce faster cutting and smooth finish. Re-sharpening of segments permits many cuts per segment, and replaceability of segments makes possible continued use of the same disc... For most satisfactory results, use Motch & Merryweather blades with Motch & Merryweather circular sawing machines for cutting off stock up to 16½" diameter.

Write for Bulletin 200-A.

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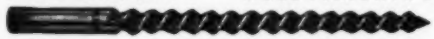

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BAUMBACH *The* BEST IN DIE SETS

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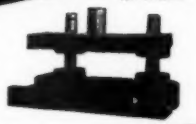

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- Bar work to 2½". Chucking work to 12". Precision work to Navy tolerances. Complete tool room; bench facilities; turret and engine lathes; millers; oil grooversr; welding; skilled labor. Can assist in design or modification of product for lower cost or mass production. Engineering cooperation at your service.

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CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

DESIGNING ENGINEER of high type, accustomed to hydraulic pumps. Must be at least 40. Write, giving name of university graduated from, experience, references and salary expected. P-9588, American Machinist.

WANTED TOOL Designer with practical experience in tool steel and specialty rolling. Must be capable of handling administrative duties of rolling mills. P-9944, American Machinist.

SELLING OPPORTUNITIES OFFERED

REPRESENTATIVE WANTED throughout the U.S. by manufacturer of standard line of carbide and steel cylindrical gages. Good opportunity for commission salesmen with allied lines. Exclusive basis. RW-9020, American Machinist.

WE HAVE an opening in our modern small tool division for a man who is thoroughly familiar with the development and sale of small tools such as die heads, taps, etc. Good opportunity for an experienced aggressive man. In your reply please give full information regarding experience and companies with whom you have been connected as well as age. Modern Tool Works, Rochester 10, New York.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service. 39 years recognized standing and reputation. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

TWENTY-NINE years' experience in the metal working industry as cost reduction Engineer, Production Engineer, Tool Supervisor, Plant Layout, Supervisor of Methods and Superintendent of assembly, desires connection, please write for detailed resume. PW-1029, American Machinist.

ATOMIC AREA! Is your organization geared for this emergency! My employment could increase your production and profit. 10 years of resultful experience in production, sales and supervision in the precision machinery field. Successfully installed wage incentive, designed special machinery, plant layout, process, sales and supervise. 35 yrs. old. Additional facts furnished to prove my ability. PW-1124, American Machinist.

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TOOL ENGINEER, Salesmanager with promotional abilities, jobbing shop experience in tool estimating, design and stampings etc. With excellent following in St. Louis and surrounding territories. Would like to make new connections with fair sized company. Drawing account and percentage basis. SA-1097, American Machinist.

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is anxious to buy or license patent or other rights to new products in housewares, gadget field. If you have developed a new product, tell us about it. Write Ahmeo Products, 678 Mass. Ave., Cambridge, Mass.

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with shop, design and sales experience has $20,000 to invest in going shop where services can be used to advantage. BO-1646, American Machinist.

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Patent Practice

before U.S. Patent Office, Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel. Registered Patent Attorneys, Suite 453, 815-15th Street, N. W., Washington 5, D. C.

WANTED TO BUY

Plant making fabricated metal product requiring gray iron castings. Must be sound proposition having profit and growth possibilities. Inquiries confidential.

BO-9942, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

DESIGNERS MACHINE TOOLS

Large Builder of Machine Tools in Midwest requires machine tool designers with experience in the design of vertical boring mills. Salary commensurate with ability. Give details regarding training, experience, and salary required. All replies will be treated confidentially.

P-1125, AMERICAN MACHINIST
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WANTED PRODUCTION MANAGER

Must be thoroughly familiar with screw machine, drill press, milling machine and drop forging. Must have practical experience in die and jig design. Must be 30 years of age or over. Good opportunity for right man with growing company. Write full details of qualifications and experience in first letter.

OWATONNA TOOL COMPANY
Owatonna, Minnesota

WANTED SUPERINTENDENT

Plant employing 60 men in northern Ohio. Must have at least 15 years of practical experience, with a fair amount of technical training. Nature of work, building special machinery, dies & fixtures. State age, class of work have done, salary expected, nationality, habits, and any other information of interest.

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BLANCHARD SURFACE GRINDER

Only model 27 R acceptable

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Double Crank Press. 8 to 10" Stroke. 200 to 250 Ton Capacity. Bed Area—48" R to L, 36" F to B. Approx. 15" Shut Height. Must be in good running condition. Write

LUITINK MANUFACTURING CO.
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WANTED

45-ton Used Steam Locomotive Crane, give age, make, condition and price. Include location, length of boom and type of side frames.

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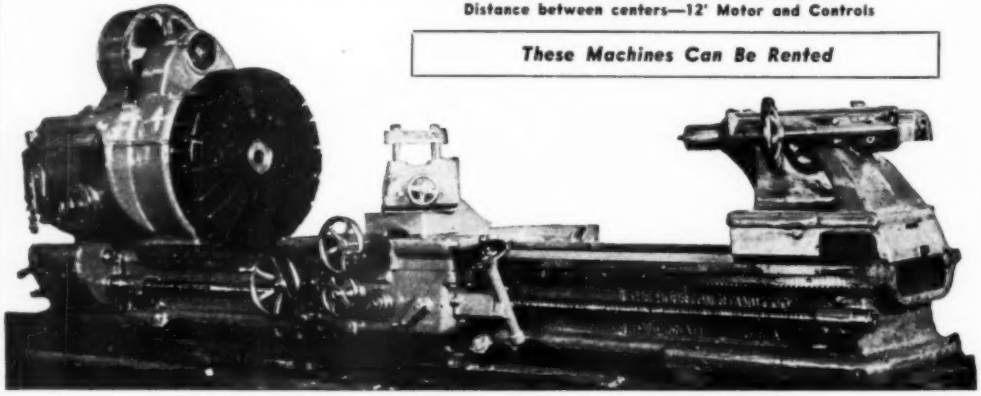
Heavy Duty Engine Lathe

54" x 18' HOUSTON STANWOOD & GAMBLE

Swing over ways—54", Swing over carriage—42½"
Distance between centers—12' Motor and Controls

These Machines Can Be Rented



16' x 24' NILES BEMENT POND EXTENSION TYPE BORING MILL
2000 TON HPM. FASTRAVERSE HOBBING PRESS
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16"x10' AMERICAN 12-speed Grd. Hd., AC MIB taper
18"x12' LODGE & SHIPLEY Selec. Grd. Hd., AC MD
18"x10' AMERICAN Grd. Hd., AC MD
20"x8' LODGE & SHIPLEY Selec. Grd. Hd., AC MIB taper
22"x10' ROCKFORD 3 SCD DBG bowl hd.
24"x12' BOYE & EMMES, AC Turner Uni-Drive
24"x12' AMERICAN Grd. Hd., AC MD taper
24"x14' LODGE & SHIPLEY, Turner Drive, taper
24"x18' AMERICAN Grd. Hd., AC MD, taper
30"x16' LODGE & SHIPLEY, Lima Drive, taper

MILLERS

#2 CINCINNATI H.P. Rect. & A Plain, AC MIB, PRT, Timken
#3 CINCINNATI H.P. Universal, AC MD, div. hds.
#3A BROWN & SHARPE Universal, AC MD, div. hds.
#3B MILWAUKEE DOA Plain, AC MIB, PRT
#4 CINCINNATI H.P. Univ., Lima Drive, div. hd., slot. attach.
#5 CINCINNATI H.P. Rect. & A Plain, PRT, AC MD
#2G LEBLOND All-Geared Univ., AC MD, div. hd. Type "F" OHIO Production, AC MD, new 1943

SHAPERS

16", 20", 24", 28", 32" GOULD & EBERHARDT
24" AMERICAN "Auto Oiled", AC MD
28" AMERICAN Hvy Duty, AC MD
28" CINCINNATI Heavy Duty, AC MD, PRT, new 1943

RADIAL DRILLS

3½' AMERICAN "Triple Purpose", AC mtr on arm
4' MORRIS Enclosed Head, AC MD
6' CINCINNATI-BICKFORD, mtr on arm
7' DRESES, AC MD

GRINDERS

#3 ABRASIVE Surface, AC MD
#22 HEALD Rotary Surface, new 1943
10"x24" LANDIS Type C Univ. Hydr., new 1943
#2 CINCINNATI Tool & Cutter, AC MD, late type

BORING MILLS

#3A UNIVERSAL Horz. 3" bar, SPD
36" BULLARD "New Era" V.T.L.

GEAR MACHINERY

#6—72" BROWN & SHARPE Gear Cutter, AC MD
#12H GOULD & EBERHARDT Hobber, AC MD
#16N GOULD & EBERHARDT Hobber, AC MD
#34 BROWN & SHARPE Hobber, AC MD

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22"x22"x6' CINCINNATI, 1 hd.
28"x28"x6' CINCINNATI, 1 hd., box table, AC MD
30"x30"x10' Whitcomb, AC MD, 2 hds.
36"x36"x10' GRAY Extra Hvy. Pat., 2 hds.

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#3R Gisholt Turret Lathe 6¼"
#2 and #3 Warner & Swasey Turret Lathes
42" and 54" Bullard SPIRAL DRIVE Vertical Turret Lathes
12" 6-spdl. Bullard Mult-Au-Matics (2)
#32 Lucas Horizontal Boring Mill
36"x25' centers Niles Bement Pond Lathe
13"x30" centers Pratt & Whitney Lathe "B"

HAZARD BROWNELL MACHINE TOOLS, INC.
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Industrial washing machine—for washing and blowing off small metal parts—capacity 750# per charge—production cycle approx. 10 minutes—solution tank heated by steam coils—centrifugal pump in wash unit 7½ HP motor—centrifugal blower 3 HP motor—electrical equipment 440 volt, 3 phase, 60 cycle—dimensions approximately 13'6" long, 4'6" wide, 7'9" high.

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110 Ton Cleveland Press Model 118 Air Cushion, W/M—New 1946 A-1 Cond.

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Niagara 10' x 16 Ga. Power Squaring Shear, Serial No. 39586, practically new.
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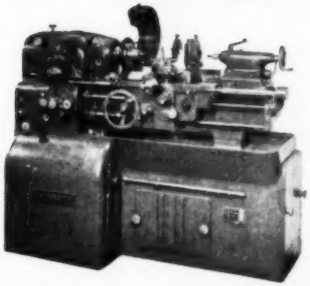


10"x20" Model #EE Monarch Precision Toolmakers Lathe. Late Type. W/Taper Attach. Collets, chucks, toolholders, tool cabinet. Immediate shipment.

TURRET LATHES

Bardons & Oliver #1 Electric Turret Lathe. ¾" cap. Has bar feed & collets.
Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw, Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.
Warner & Swasey #1A Universal Heavy Duty Saddle Type Turret Lathe. Serial #648220. Capacity—2½" rd., Grd. Hd. 12 speeds. Coolant system, bar feed, chuck & tooling. Immediate delivery. Excellent condition. Hydraulic Speed Selector.

Bliss-Consolidated #77 Motor Driven Open Back Gap Frame Single Crank Single Action Backgeared Power Press. Has Automatic Roll Feed & Roll Straightener, also Ejector under Bed. 160 Tons Cap. 10" Stroke. Tie Rods & Inclined Base.

ENGINE LATHES

LeBlond 36"x30' Q.C.G. Hvy. Duty Geared Head Screw Cutting Engine Lathe. Serial #NK-230. 12 Speed Head. 36" internal grd. faceplate, Taper Attachment, Dial Thrdg. Set of toolholders. Max Swing—39". Centers—22'6". 25 h.p. 3/60/220/440 volts V-belt drive.
24"x16' American Q.C.G. Motorized Cone Head. 11' centers. Taper Attachment 24" chuck, faceplates, cabinet type legs. 220/440 volts motor
.0"x10' American, Q.C.G. 72" centers.
20"x10' Hendey Motorized.
20"x8' Lodge & Shipley. Q.C.G. M. Dr.
18"x8' Davis Q.C.G. 42" centers, equipment.
18"x8' Lodge & Shipley, geared head.
18"x6' American, Geared Head, M.D.
18"x6' Monarch 8-Speed hd. Q.C.G. 220 volts motor. Actual swing—20¼". 20" c.c. Hex. Turret on crosslide. Cabinet legs.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Monarch 8-Speed Hd. Q.C.G. 220 volts motor. 24" c.c. Univ. Chuck, Draw-bar & set of 16th collets and 32nd collets.
16"x6' South Bend Enclosed Head. Motor driven. Taper Attachments, Chucks, Collets & Quick Acting Collet Chuck.
14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, Chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, Collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48" Completely rebuilt. Immediate shipment.

BETTS 100" Special Vertical Boring and Turning Mill. 1944 Machine. 2 Plain Heads. Complete electrical equipment. Excellent condition. Immediate delivery.

LATE TYPE GRINDER

Mattison 12" x 16" x 48" Motor Driven Precision Hydraulic Horizontal Surface Grinder. Serial #13025. Excellent condition. 220/440 motors. W/12" x 148" Chuck & G.E. Generator. Built-in push button controls. ONE AVAILABLE.

GRINDING MACHINES

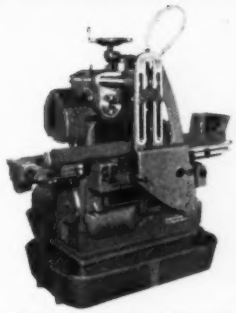
Blanchard #16 Motor Driven Vertical Rotary Surface Grinder. 26" Chuck with power down feed.
Cincinnati 10"x36" Plain Hydraulic Cylindrical Model #EA. Serial #5P2D1L-19. Filmatic Bearings. Built-in Electrics. Hydraulic Infeed.
Heald #22 & #25, 12" & 16" Horizontal Rotary Surface Grinders. Motor driven.
Cincinnati 'Monoset' Model #OE Cutter & Tool Grinder, Motor driven. With motors & controls. Set of collets, taper & cylindrical and equip.
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto, downfeed to head. Motor driven exhauster unit.
#2 Cincinnati Universal Tool & Cutter Grinder. Late Type. Univer. Motor Driven Workhead, Diamond Bracket, etc. 220/440 volts motor.
Norton 6x18 Vertical Rotary Automatic Surface Grinders. 220/440 volts motors. Excello Spindles. Hydraulic Table feeds. Three Available with immediate delivery. Also 6x18 Horizontal.

AUTOMATICS

#0G & #00 Brown & Sharpe Automatic.
#2G Brown & Sharpe Standard Speed. 220/440 volts motor & push button controls. Complete coolant, turret tooling, collet & collet chuck, toolblocks.
#2 Brown & Sharpe Automatic Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system.
Cleveland Model "A" 3¾" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system. 1943.

PUNCH PRESSES

O.B.I. Johnson (NEW) all sizes, geared & plain.
O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized.
O.B.I. Michigan, 36 tons cap. Wide ram & bed.
#39B Bliss Horn, 220/440 motor.
#68C Bliss Dble. Action 3-Crank.
#91C Toledo Sgle. Act. Dble. Crank S.S.
#305 Bliss S.S.S.A. 95 Tons Cap.
#15H Rousselle Horn. 220/440 motor.
#3A Bliss S.A.S.S. Dble. Crank.



Brown & Sharpe #12 (Electrics built-in) Late Type Milling Machine. 24" Table Travel. Motor driven coolant. Also 18" travel machines. Immediate shipment.

MILLING MACHINES

Cincinnati #3, #4, #5 Pl. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain.
Milwaukee #2K Vertical, M. Dr. Dial Type.
Milwaukee #3K Vertical, M. Dr. Dial Type.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal.
#3 Dial Type, H.S. Cincinnati Vertical Mill. Power Rapid Traverse, speeds up to 1300 r.p.m. Range—34"x16"x16" Head has 6" vertical with four stop indicator. Serial #4A3V1L-61. Timken Bearing. 10 h.p. motor drive in base.
#3V Van Norman Ram Type Vert. Late Type.
#2, #3, #4 Cincinnati High Power Vert.
#4-36 Cincinnati 4-Spdle. Duplex Hydromatic.
#4-36 Cincinnati Plain Hydromatic

UNIVERSAL MILLING MACHINES

Index #40H, 16"x8½"x16".
B & S #2, 20"x5"x17½".
B & S #1½, 20"x7"x18".
Bridgeport, 20'x9'x16" Turret Type.
Garvin #2MU, 24"x8"x18".
K & T "Milwaukee" #2, 28"x10"x17".
Kempsmith #2, 28"x8½"x18".
Cincinnati #2, 28"x10"x18".
Cincinnati #2M, 28"x10"x18".
B & S #3, 34"x10"x21".
Cincinnati #3S 34"x12"x20".
Some w/index heads & equipment.

RADIAL DRILLS

Cinci-Bickford 6' Arm, 15" Col. 24 Speeds.
Cinci-Bickford 5' Arm, 13" Col. 24 speeds.
Cinci-Bickford "Super-Service" 6'-19".
Cinci-Bickford 3' Arm, 9" Col. 12 Speeds.

BORING MILLS

2½" bar Cleveland Horiz.
3½" bar Giddings & L. Horiz.
5" bar Barrett #2 Cylinder.
8" bar Barrett #6 Cylinder.
Ryerson #11 Horiz. 3" Capacity, #6 M.T.
24" Bullard Vertical, Motorized.
42" Bullard Vertical, Motorized.
54" Bullard Vertical, Motorized
42" Gisholt Vertical, Motorized.
60" Betts Vertical, Motorized.

EASTERN OFFERS FROM STOCK

AUTOMATICS

No. 4D Potter & Johnston, m.d., latest
8 spindle 1⅝" Cone, m.d., latest
4 spindle 1¼" Conomatic, m.d., bar, 1942 machine
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
20x25" Jones & Lamson, m.d., latest
4 spindle ⅞" Model R-4 Acme Gridley, m.d.
4 spindle 2¼" Cleveland Model "K", m.d.
2¼" Gridley Single Spindle, m.d.
2½" Cleveland Model A, m.d.
4¼" Cleveland Model A, m.d.
4½" Cleveland Model A, m.d.
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7¾" Cleveland Model A, m.d.

BOLT MACHINES

Victor Nut Facing Machine, m.d., latest
¾" Style H. Economy Automatic Threading Machine, belt drive
3 spindle 1¼" Acme Bolt Threading Machine, cone

HORIZONTAL BORING MILLS

No. 0 Giddings & Lewis, m.d., 3½" bar
2½" Cleveland, m.d.
3½" Cincinnati-Gilbert Floor Type, m.d.
No. 25T Giddings & Lewis, m.d., 2½" bar, latest
No. 31 Lucas, 3" bar, m.d.
No. 33 Lucas, 4½" bar, m.d.
No. 45 Giddings & Lewis, m.d., 5" bar
4" bar Detrick & Harvey Floor Type, m.d.
5½" bar Niles, m.d.
10" bar Sellers Floor Type, m.d.

VERTICAL BORING MILLS

21" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
36" Bullard New Era, m.d., with side head
42" Bullard New Era, m.d., with side head
42" Bullard Spiral Drive, m.d., with side head
42" Colburn H.D., m.d., 2 swivel heads
48" Cincinnati Rapid Production, m.d., 1 turret head, 1 swivel head
48" Colburn, H.D., m.d., 1 turret, 1 swivel head
48" Putnam H.D., m.d., 2 swivel heads
54" Colburn, m.d., 1 turret, 1 swivel head
72" King, m.d., 2 swivel heads, 1 side head, latest
100" Niles Heavy, m.d., 2 swivel heads, p.r.t.
100" Niles Extra Heavy, m.d., p.r.t., late
120" Niles Heavy, m.d., 2 swivel heads, p.r.t.

BROACHING MACHINES

No. 4 Oil Gear Hydraulic, m.d., 64" stroke
75 H.P. LaPointe Horizontal Hydraulic, 150" stroke, 32½ tons cap.
Cincinnati Mill Broach, m.d., 10" spindles, new

BALL BEARING DRILLS

Model D 1100 B Walker-Turner Bench Type, 20" size, brand new
2 spindle 20" Canedy-Otto, m.d., No. 4 Taper
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2—12" Foote-Burt Single Spindle, m.d.
No. 4 Fosdick, 8" overhang, belted m.d., No. 2 Taper
No. 4BM—24" Fosdick, m.d., latest
No. 5M—16" Fosdick, m.d.
2 spindle No. 3 Avey, belted m.d., p.t.
3 spindle No. ½ Avey, Heavy, direct m.d., latest
4 spindle No. 2 Avey, belted m.d.
4 spindle No. 2LMS Leland-Gifford, 26" swing, m.d. on each spindle
6 spindle Leland & Gifford, No. 2 Taper, m.d. on each spindle
6 spindle 2B Edlund, m.d., No. 2 Taper
6 spindle No. 3 Avey, belted m.d.

HORIZONTAL DRILLS

Morris Horizontal Mer-Speed, m.d.
No. 1½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½Bx30" Pratt & Whitney Deep Hole Drill, m.d., latest
No. 1½Bx30" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1½Bx30" Pratt & Whitney Chambering Machine, m.d., latest
No. 1Bx24" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, m.d.
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., older type
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic Drill, belt
No. 6 Barnes Twin Spindle Honing Machine, m.d.
2 spindle No. 410 W.F. & John Barnes Deep Hole Drill, m.d.

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x36" head, 15 spindles
No. 3 Baush, m.d., 20x40" head, 15 spindles
P7 Baush Hydraulic, m.d., 20x30" head, 12 spindles, latest
D13H Natco Hydraulic, m.d., 18x12" head, 10 spindles
No. 16 Fixed Center Foote-Burt, m.d.
5 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle Foote-Burt Rail, No. 4 Taper, m.d.
4 spindle Niles-Bement-Pond H.D. Rail, m.d., 12' rail, No. 5 Taper

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LATHES

30"x12" cc NILES "Timesaver," 1941
36"x10" cc LODGE & SHIPLEY
36"x13" cc AMERICAN High Duty, 1942
36"x25' cc NILES Heavy Duty, 1942
48"x20' cc BETTS-BRIDGEFORD, 1941
48"x20' cc DRIGGS Geared Head
No. 2A, 3A, 4A WARNER & SWASEY Turret Lathes, new 1941, full tooling
No. 4H LIBBY Turret Lathe, cross sliding turret, 1943

MILLING MACHINES

No. 1274 KEARNEY & TRECKER Simplex, 1944
No. 2K KEARNEY & TRECKER Universal
No. 3 CINCINNATI Plain, dial type, 1942
No. 3B CINCINNATI Universal
No. 3 CINCINNATI, high power, plain, 1942

RADIAL DRILLS

4'-11" CARLTON
5'-13" CARLTON, arm extended to 7'
5'-15" AMERICAN Holewizard, 1942
6'-19" CINCI. GILBERT, mtr. on arm

MISCELLANEOUS

84" CONSOLIDATED COLBURN Vertical Boring Mill, 2 heads, rapid traverse, AC motor
No. 32 LUCAS Hor. Boring Mill

20"x96" NORTON Cylindrical Grinder, AC motors

No. 5 NEWARK Universal Gear Hobber, 72" cap.
24" GOULD & EBERHARDT "Industrial" Shaper, 1940

WRITE TO— **O'CONNELL MACHINERY CO.** 1825 NIAGARA ST BUFFALO 7, N.Y. PROMPT DELIVERY

LATE TYPE MACHINES FOR SALE

American Hole Wizard Radial 6'x15"
Rowbottom Cam Miller
Pratt & Whitney #2 Jig Borer
Van Norman Universal Miller #22L

CAPITOL MACHINERY
199 Mott St., New York 13, N. Y.
Telephone—WOrth 4-7615-6

FOR SALE
INDUSTRIAL CHILLING MACHINE
DEEP FREEZE CASCADE 120° F. Height 38" Length 82", Width 32¼", Approximately 7½ cubic feet, WITH 2 MOTORS, ½ and ⅓ HP, 3/60/220.
PRICE $850.00
WINSTON MACHINERY CO., INC.
517 South Delaware St., Indianapolis 4, Ind.

FOR SALE
Rotary Vibrating Riveter
One number 4A Grant Rotary Vibrating Riveter, two HP motor. Practically new condition. Some extras.
UNIVERSAL GRINDER
One number 2 Cincinnati
MEMPHIS CASTING WORKS INC.
1006 Oakland Ave., Memphis 1, Tennessee

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946

(Title 39, United States Code, Section 233)

Of American Machinist published Bi-Weekly at New York, New York for October 1, 1949.

State of New York }
County of New York } ss.

1. The name and address of the publisher, editor, managing editor, and business manager is: Publisher, McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York, N. Y.; Editor, Burnham Finney, 330 W. 42nd St., New York, N. Y.; Managing editor, J. J. Tangerman, 330 W. 42nd St., New York, N. Y.; Business manager, W. E. Kennedy, 330 W. 42nd St., New York, N. Y.

2. The owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y. Stockholders holding 1% of more of stock: Curtis W. McGraw, Executor of the Will of James H. McGraw, 330 West 42nd Street, New York 18, N. Y.; James H. McGraw, Jr., Curtis W. McGraw and Willard T. Chevalier, Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Courtis W. McGraw; James H. McGraw, Jr. and Curtis W. McGraw, 330 W. 42nd St., New York 18, N. Y. Trustees for Catherine Osmun, 330 West 42nd Street, New York 18, N. Y.; Edwin S. Wilsey and Curtis W. McGraw, Trustees for James H. McGraw, 3rd, Madison, New Jersey; James H. McGraw, Jr., 330 West 42nd Street, New York 18, N. Y.; Curtis W. McGraw, 330 West 42nd Street, New York 18, N. Y.; Donald C. McGraw, 330 West 42nd Street, New York 18, N. Y.; Mildred W. McGraw, Madison, New Jersey; Grace W. Mehren, 526 Arenas St., LaJolla, Calif.

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4. Paragraphs 2 and 3, include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

By J. A. GERARDI, Secretary

McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 16th day of September, 1949.

[SEAL] ELVA G. MASLIN

(My commission expires March 30, 1950)

LATE TYPE MACHINE TOOLS

AUTOMATICS
6" RPA-8 Acme-Gridley Chucker, 1941.
16" Bullard Mult-Au-Matic, 6 spdl, 41.
1⅝" Greenlee, 6 spindle, 1942.
9/16" RA-6 Acme-Gridley, 1942.
No. 60 New Britain, 1" cap, 1943.

BORING MACHINES
No. 42 Lucas Horizontal, 1940.
No. 54 Excello Double End, 1940.
No. 46B Heald Single End, 1940.

DRILLS
3' 9" Morris "Mor-Speed", Latest.
25" Fosdick "Economax", 1941.
W-6 Baush Hyd. Mult. Spdl, 1943.
No. 40 Fox Multiple Spdl, 1944.

GEAR EQUIPMENT
3" & 12" Gleason Generators, 1941.
No. 6 & 17 Gleason Testers, 1943.
12" Red Ring Internal Shaver, Late.
No. GCL-3 Red Ring Shaver, 1942.
No. 624A3 Fellows Side Trimmer, New.
No. 615A & 61A Fellows Shapers, 1943.
No. 7125A & 712 Fellows Shaper, 1943.
Vinco Spline & Gear Grinder, 1942.

GRINDERS, CYLINDRICAL
16" x 36" Cincinnati Plain, 1942.
12" x 48" Cincinnati Univ, 1943.
10" x 72" Landis Plain, 1942.
10" x 18" Norton Plain, 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge, 1941.
No. 72A3 & A5 Heald Plain, 1944.
No. 5 & 16A22 Bryant, Latest.

GRINDERS, SURFACE
14" x 36" P&W Vertical, 1938.
No. 22 & 25A Heald Rotary, 1943.
No. 2-1 Reid, 6" x 18" cap, 1940.

LATHES, ENGINE
45" x 102" Axelson, 1942.
28" x 276" Bertram, 1942.
24" x 168" Sidney, 1942.
18" x 54" Lodge & Shipley, 1943.
18" x 48" Bradford, 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic", 1943.
No. 3A L&S "Duomatic", 1943.
No. 2FU Foster "Fastermatic", 1943.
20" x 97¾" LeBlond Rapid Prod, 1941.
8" x 108" "Lo-Swing Semi-Auto, 1942.
Model 8, 10 & 12 Sundstrand, 1942.
14" x 42" Monarch "Magna-Matic", 1941.

LATHES, TURRET
36" Bullard Vertical, 1943.
No. 2A & 3A Warner & Swasey, 1943.
No. 1 & 3½" x 24" Acme Univ, 1943.
No. 3L Gisholt, 1941.
No. 2, 3, 4 & 5 Warner & Swasey, 1943.
No. 2, 3, 5 & 7 Bardons & Olivet, 1942.

MILLS, PLAIN
No. 5 Cincinnati, 1943.
No. 4H & 4K Milwaukee, 1943.
No. 3 Van Norman, 1942.
No. 2HL Milwaukee, 1942.

MILLS, PRODUCTION
BL-2420 P&W "Keller", 3 sp, 1942.
BL-2416 P&W "Keller", 1 sp, 1943.
BG-1 Keller, single spdl.
No. 1-14 & 2-20 Kent Owens, 1942.
No. 1248 Kearney & Trecker, 1942.
No. 1-18 & 2-18 Cincinnati, 1942.

MILLS, THREAD
6" x 60" Pratt & Whitney, Latest.
12" x 54" Lees Bradner, 1943.
4" x 9" Hanson Whitney, Late.

MILLS, UNIVERSAL
No. 2MH Cincinnati, 1942.
No. 2H Milwaukee, 1942.
No. 2SU & 26SU Van Norman, 1942.

MILLS, VERTICAL
No. 3B P&W Univ. Die Sinker, 1943.
No. 2K & 3H Milwaukee, 1942.
No. 2 & 3 Cincinnati, 1941.
No. 1 Cleveland, 1942.

PRESSES
No. 40-5½ Minster, 1946.
100 Ton Hannifin, Hyd, 1942.
75 Ton Bliss Hyd., 60" Stroke, Latest.
45 Ton Reliance, 1942.

INDIANAPOLIS MACHINERY & SUPPLY CO.
1961 S. Meridian St.
INDIANAPOLIS 6, IND.

A FEW MACHINES FROM OUR LARGE STOCK

AUTOMATICS
Brown & Sharpe #00G, H.S., #4, #6, #2G
Conomatic 8 sp. 1⅞" cap., 65P—2⅝" cap.
New Britain Gridley 6I—8 Sp. 2¼"

BORING MILLS
Giddings & Lewis #6, #25T, Bullard, 42" V.T.L.
Universal 3" horiz., Lucas #31 horiz.

DRILLS AND RADIALS
Canedy-Otto 3'-9" col.
Carlton 8'-19" col., Foote-Burt 6 Sp.
Cinci-Bickford Super-Service 21", 24"
Natco Model E-5 Multi-Spindle, 14 spindles
Sibley 24—28", Allen 6 Sp., Excelsior 21"

ENGRAVERS
Gorton #3U, 3Z, 3L; Deckel 6I, 6IF
Gorton Cutter Grinders 375-2, 265-5

GEAR EQUIPMENT
Fellows #72, 725 High Speed, Mikron Gear Hobber
Michigan, Gleason, Fellows Checkers
Gleason #2 Surface Hardener

GRINDERS—Miscellaneous
Brown & Sharpe #5 cyl., 3"x18", Black Diamond
Brown & Sharpe #1, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic
Cincinnati Universal Filmatic, 12"x36", 12"x48"
Covel #91A Uiv. Tool & Cutter
Gardner #22B, 36" disc, Heald #1 Tool
K. O. Lee Tool & Cutter, Hammond #4 Carbide
Landis #4H Cyl. 4x12", #6 Thread, Landis Centerless
Norton #2 Tool & Cutter, Porter Cable Belt WGB
Norton Cyl. 6x30" Type C
Oliver #510 Drill Pointer, Sellers #4B
Pratt & Whitney Radius #R6, Greenby Int.

GRINDERS—Surface
Abrasive #1½" Wet, #14 Vertical, #13
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #18—42" chuck, #11—16" chuck
Brown & Sharpe #2
G. & L. #25, #35 Hyd.
Hanchett #300, 13x48", Mattison 14x16x48 Hyd.
Norton 6x18" Hyd., Pratt & Whitney 12x36" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES
Bradford 16"x6', Hardinge Precision 9", cabinet
Handey G. H. 16x30 with relieving att.
LeBlond Regal 10"x31½", 15x30", 19x48", 21x66"
Lodge & Shipley 16x78" T.A., LeBlond HD 16x33"
Monarch 10"x20" EE, 16x78" T.A., 12x30" CKK
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x3½', 13x36", 10" Cabinet
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet

LATHES—Turret
Acme #6W Bar and Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, #2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck—2L Saddle type
Hardinge ESM
Jones & Lamson #8A Univ., Saddle, Threading
Oster #60I Rapiduction, Morey #3, 1½" cap.
Warner & Swasey #3, #4, #5, #4A—8" Bar Cap.

MILLS—Plain & Universal
Brown & Sharpe #2B Pl., #2A Univ.
Cincinnati #3 Plain, 2MH Univ.
Milwaukee #2HL, 2H, Plain, #2HL, 2H, Univ.
Van Norman #12, 20, 22L, 36, Kempsmith 2G

MILLS—Vertical—JIG BORERS
Brown & Sharpe #2, Index, Vernon, Bridgeport
Cincinnati #4, Jackson
Gorton #8D, 9J Plain, #8½D Duplicator
Kearney & Trecker #3H, 3M High Speed
P&W 1½B Jig Borer, Sip Jig Borer #MP-5
Moore Jig Grinder, Vernon jig borer
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production
Brown & Sharpe #000, 12, 21
Cincinnati #1-12, 1-18, 2-18 Mfg.
Nichols Hand, U.S. MM 1, Kent Owens #1V
Sundstrand #00 Rigidmills, U. S. Duplex

PRESSES
Bliss #8 Dbl. Crank, Bed 42x100", 250 Ton
Bliss #675, 645B, 630 Hi-Production, 304A, 305A S.S.
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #58 OB. Gap Frame #62, 62A, 162
Henry & Wright 25, 75 Ton Dieing
Reliance 45 ton O.B.I.
Thomas 7A, 60 Ton O.B.I., Gen. Flex Elec. Screw
V. & O. #25B O.B.I., #18Z Reducing.
Zeh and Hanneman 30 tons, #7 Percussion

MISCELLANEOUS
BAND SAW: DoAll #ML, Tannewitz #36M
BENDING ROLL: Buffalo #0, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
HACKSAW: Marvel #6A Automatic, #6, #4B
HONER: Micromatic #N-1 Hydrohoner, Sunnen
IRONWORKER: Buffalo 25U x 20 Univ.
KEYSEATER: Mitts & Merrill, Baker, Davis, Burr
RIVET HAMMERS: Hi Speed, all sizes, Chic. Pneu.
ROUTER: Onsrud #W240, #55 Oliver
SHAPER: 32" G. & E. Universal
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
VERTICAL SHAPER: 6" Pratt & Whitney
WELDERS SPOT & SEAM: Sciaky, Taylor Winfield
WRAPPING ROLL: Buffalo #½

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen	Stroke	Opening
500 Ton	Lake Erie	35x36"	30"	60"
600	Bald. 6'thw'k	76x50"	22"	30"
500 D.A.	H.P.M.	36x36"	24"	30"
1000	French Oil	53x42"	20"	50"
300	Brand New Watson Stillman Hobbing Press			
375 D.A.	Elmes	84x44"	12"	42"
350	Verson	48x40	36"	72"
50	Dennison	22x20	18	23
150	Southwark	34x30	30	2' to 4'

UP MOVING RAM PRESSES
50 & 100 Ton Stokes Molding Presses & Pumps
300 Ton Dunning & Boschert Molding Press
500, 800 Ton Waterbury-Farrel 3 & 4 Rod Presses
300 Ton Watson Stillman Press, 24x20" Platens
400 & 500 Ton Shaft Straighteners—Self Contained

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

THIS IS ONLY A PARTIAL LISTING. WHY NOT SEND US YOUR INQUIRIES?

WRITE FOR OUR FREE ILLUSTRATED CATALOG

AARON MACHINERY CO., Inc.

45 Crosby Street — **New York 12, N. Y.**
WOrth 4-8233 — **Cable: AARMACH. N. Y.**

MBNA MEMBER

BIG MONEY SAVING VALUES IN LATE MODEL MACHINE TOOLS

AUTOMATICS

National Acme Model "C" 9/16", 5 spindle
Conomatic 4 spindle, 4⅝"
Acme Gridley RA-6, 6 spindle
Cleveland Model "A" 9/16"
New Britain Gridley 2¼", Model 61, 6 spindle

BORING MILLS

Bullard 24" Vert., Spiral Drive
Bullard 36", Vert., New Era Type Head
Bullard Maxi-Mill 54", 2 hds. on rail, Vert.
Lucas 3" bar, #1, Horiz.
Cincinnati Gilbert 3½" spindle, Latest Type
Heald #49, Double End Borematic
Heald #49, Single End Borematic
Heald #47 A, Boring Machine
P & H Horiz., 4" bar
Defiance #25 A Boring—Drilling, 3¼" bar
Defiance #6, 4½" bar

LATHES

American 14"x6', 3 sed, SCEL
American 16"x78" Pacemaker, 27 speeds, MD
American 16"x6', 4 sed, bg, SCEL
American 16"x6', Cullman Drive
American 16"x8', 3 sed, dbg, SCEL
American 18"x6', Geared Head
American 18"x8', 3 sed, Bowl Head, BG
American 24"x10', SPD, GH, SCEL
American 24"x12', 8 speed, GH, SCEL
American 24"x14', 8 speed, GH

AMERICAN 30"x15' GH, 12 SPEED, SCEL, M.D.
AMERICAN 30"x20' GH, 12 SPEED, SCEL, M.D.
AMERICAN 42"x16', INTERNAL FACE PLATE DRIVE 16 SPEEDS, G.H., M.D.

Boye & Emmes 18"x6', 4 sed, dbg, SCEL
Boye & Emmes 18"x6', 3 sed, dbg, SCEL
Boye & Emmes 18"x8', 3 sed, Limn Drive
Boye & Emmes 18"x10', M.D., SCEL
Hendy 14"x6', 3 sed, qc, SCEL
Hendy 14"x6', 4 sed, Drive all Drive
Hendy 14"x6', Model EBM, Motor driven
Hendy 16"x6', 4 sed, dbg, SCEL
Hendy 18"x8', 4 sed, SCEL
LeBlond 12"x6', spd, 12 speeds, gh
LeBlond 12"x8', 3 sed, dbg
LeBlond 21"x8', 3 sed, dbg, SCEL
LeBlond 24"x10', 3 sed, SCEL

LEBLOND 25"x12' H.D., QC, SCEL, M.D.

LODGE & SHIPLEY 14"x30' CENTERS, SELECTIVE G.H., M.D.

Lodge & Shipley 14"x5', 5 sed, bg, SCEL
Lodge & Shipley 14"x6', 3 sed, dbg, SCEL
Lodge & Shipley 16"x8', Selective G.H.
Lodge & Shipley 18"x8', spd, SCEL
Lodge & Shipley 18"x8', 3 sed, dbg, SCEL
Lodge & Shipley 18"x9', 3 sed, dbg, SCEL

LODGE & SHIPLEY 20"x8' GH, SCEL, M.D.

Lodge & Shipley 20"x10', 5 sed, SCEL
Lodge & Shipley 24"x10', 3 sed, dbg, Turner Uni Drive
Lodge & Shipley 36"x26', Patent Head, Internal Face Plate Drive
Monarch 14"x6', 3 sed, dbg
Monarch 16"x8', 8 speeds, SCEL

NILES TIMESAVER 30"x10' CENTERS, DOUBLE WALL APRON

Sebastian 16"x8', 4 sed, SCEL
Sebastian 20"x8', GH, SCEL
Schumacher & Boye 36"x24', Internal Face Plate Drive
Springfield 18"x8', 4 sed, SCEL

GEAR CUTTERS

Brown & Sharpe #3—36" Automatic, SPD
Gould & Eberhardt 18H, spd, MD
Gould & Eberhardt 36S, Vert. cutter
Brown & Sharpe #3—26", MD
Fellows #6I5, Helical
Gleason 6" straight Bevel, MD
Gleason 15" Spiral bevel gear Generator

GRINDERS, ALL TYPES

Cincinnati #" Centerless
Cincinnati #3 Centerless
Brown & Sharpe #13 Univ. & Tool Grinder
Covel #91A Univ. Cutter & Tool Grinder
Gardner #120A Opposed Wheel Grinding Machine
Sellers #4T Tool Grinder
Landis 4"x12" Type H Plain Cylindrical Grinder
Landis 12"x72" Plain Self Contained Grinder
Norton 14"x96" Type BA Plain Grinder
Landis 20"x220" centers, Plain Cylindrical Grinder
Landis 16"x72", Plain Self Contained
Brown & Sharpe #12 Plain Grinder
Norton 14"x36" Univ. Grinder
Landis 10"x24" Type "C" Hyd. Univ. Grinder

TURRET LATHES

WARNER & SWASEY #1A, SADDLE TYPE, MD

Warner & Swasey #2, Ram type

GUARANTEED MACHINERY

Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

CHECK THIS LIST OF FINE TOOLS

AUTOMATICS

½"x2" No. 0G Brown & Sharpe automatic.
8" Bullard Multaumatic, 6 station, single index.
⅝" National Acme Gridley Model R-8 6 spindle.
⅞" Cone 4 spindle.
1¼" Cone 4 spindle.
1⅛" Cleveland Model M, 4 spindle.
1⅜" No. 61 New Britain Gridley 6 spindle.
1⅝" Greenlee 6 spindle.
1⅞" Conomatic 8 spindle.
2"x18" Cleveland Model B.
2⅛" Acme Gridley Model RA6, 6 spindle.
No. 454 New Britain 4 spindle chucking.
14"x18" Monarch Mag-Na-Matic lathes.
14"x19" Fay, front and rear tool slides.
6" Sundstrand automatic stub lathe.
1" Economy type B automatic shaver, hopper feed.
No. 16 New Britain 6 spindle chucker with set of 9" two jaw chucks.

BROACHES

2 Ton American Model HO horizontal hydraulic.
No. 2-48 Cincinnati duplex vertical surface breach.
No. 1 Foote Burt double ram vertical surface.
No. 3 Type XA Oilgear hydraulic.
No. 3 Lapointe screw type.
American V48 vertical pull broach.
Model HAS 10-72 Colonial 10 ton 72".
10"x72" Colonial broach sharpener.

DRILLS UPRIGHT AND HEAVY DUTY

20", No. 2 Colburn single spindle box column
20" W. F. & J. Barnes box column.
20" Cincinnati Super-Service production.
20" Hammond type BA.
20" Sibley.
21" Canedy Otto New.
21" Cincinnati, Bickford box column Mfg.
21" Barnes 4 spindle No. 210
22", No. 121 Baker box column heavy duty.
24" Cincinnati Bickford.
24" Cincinnati Bickford box column Mfg.
24" Kokomo.
24" No. 217 Baker 3 spindle, box column heavy duty.
24" No. 310 Baker heavy duty manufacturing.
24" No. 315 Baker box column heavy duty.
24" No. 25 Foote Burt heavy duty.
28" Aurora.
36" No. 513 Baker heavy pattern high speed.
No. 30 HO Baker hydraulic feed, 2 spindle, inverted type.

DRILLS, MULTIPLE

Baush horizontal two way multiple.
42 Spindle No. B16 Natco, 18"x48" drilling area.
34 Spindle No. 30 Natco, 22"x38" drilling area.
No. B4A Natco multiple drill or Holetapper.
22 Spindle No. 14 Natco, 16"x24" drilling area.
22 Spindle No. 15 Natco, 16"x24" drilling area.
16 Spindle No. 2 BL Natco hydraulic feed.
12 Spindle No. 39 Natco rail type.
No. 11 Natco 11" diameter round head.
12 Spindle No. 25 Baush hydraulic feed rail drill.

BORING MILLS, HORIZONTAL AND VERTICAL

2½" No. 25T Giddings & Lewis.
3" No. 3A Universal.
3¾" No. 32 Lucas table type.
3¾" No. 5A Defiance table type.
5" bar Jones planer table type.
100" Niles Bement Pond. Extra Heavy Pattern vertical.
52" King vertical.

SHAPERS

28" Gould & Eberhardt, "Invincible" type.
24" Gould & Eberhardt.
24" Columbia Heavy Duty with universal rotatable table.
20" & 24" Gemco universal. NEW.
20" Gould & Eberhardt.
20" Gould & Eberhardt high duty.
Two 6" Pratt & Whitney vertical.

THREADERS

No. 11 Murchey ¼" to 1½" long bed pipe or bolt.
2" Landis pipe threader.
2" Hill Acme.

MILES MACHINERY CO.
SAGINAW, MICH.

BRAKES—(Press) Cinc. 10'x⅝" (1935) Geo. Ohl 10½'x⅝"
HAMMERS—Beard Drop, Bliss 300 lbs.
AUTOMATICS—Natl. Acme 1⅝", four spindle, Bargain (2).
HYDRONONER—Micromatic Model #4H (1943).
LATHE—Bamford-Chase, Tool Room, 14"x6', Taper late.
LeBlond, Gap, 36"-64" swing x 14'-23' centers, Latest.
PLATE EDGE PLANER—H. & J. 32'x2".
MILLER—Plain K. & T. #4K, Late.
PLANER — Niles Bement Pond, 48"x48"x26', 4 Heads.
PRESSES—Bliss #6, 125 ton, Late.
Clearing, 200 ton (1943)
Bliss #310, 450 ton.

Lake Erie, 750 ton, Hydraulic, Bed 72"x146", single or dble action, Late.

ROLLS—Bending, 30'x1¼" Pyramid.
Bending, 11'x¾" Initial.

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N. Y.
DEPT. "A"
Phone: TRiangle 5-5237

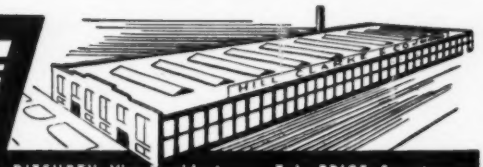
McDONALD
USED MACHINERY

Colburn 62" Hvy. Duty Vertical Boring Mill
G & L and Universal 3" Bar Horiz. Boring Mills
Dreis & Krump 10' Press Brake, No. 14 — Ga. M.D.
Campbell 6" Cap. M.D. Abrasive Cut-Off Mach.
Moline 6-Sp. Hole Hog Drill, Barnes 4-Sp.
20" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Do-All 8 x 24" Horiz. Sp. Hydr. Surface Grinder
Blanchard M.D. Vert. Sp. Surface Grinder 20" chuck
L & S 20" x 8', 18" x 12', 20" x 10', 28" x 12'
Axelson 20" x 12', Hendey 14" x 6', Amer. 17" x 6'
Monarch 20" x 8', Amer. 26" x 12' g-d. hd. q.c.c. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin. No. 3, Mil. No. 2-B & 3-B, Cin. No. 5, LeBlond No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mil. No. 2-B, Cin. No. 1-M, Cin. No. 2, Grd. Hd. Univ. Millers
Cin. 36" M.D. Univ. Shaper, G & E & Amer. 24" Shapers
Cleveland 48" x 12' Table Openside Planer, 3 Hds.

MDNA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. h. PRICE, Secretary

AUTOMATICS

15⅝" Greenlee, 8 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1¼" (1942)
No. 6 Brown & Sharpe, M.D.
No. 49 New Britain, 4 Spdl. Chucker
Model A 2½" Cleveland (1943)
Model A 3¾" Cleveland (1942)

DRILLS

No. 150 Baker, tapping (1942)
No. D8 Colburn, No. 6 Morse Taper
No. 2 Fosdick 4 Spdl. (1942)
No. 2 Fosdick 6 Spdl. (1942)
No. 1-LMS Leland-Giffords (1942)
No. 2-LMS Leland-Giffords (1942)
No. 4BL Natco 36 Spdl. (1943)
5' Western Heavy (1942)
6'-17" Col. Fosdick Economax Radial

GEAR MACHINES

No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 18H Gould & Eberhardt
72" Cincinnati Gear Cutter

BORING MACHINES

3" Bar Universal Tri-way (1946)
No. 31 Lucas, 3" bar, M.D.
No. 48-B Heald Bore-Matic (1942)
No. 112—C Excello 2 Spdl. (1942)
42" Colburn, M.D.
60" Colburn, M.D.
72" Niles Extra Heavy
94" Betts, M.D.

GRINDERS

3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders ranging from 6"x18" to 24"x240"
12"x48" Cincinnati Univ. (1947)
No. 5—8"x24" Covel Hydr. Surf. (1941)
72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
Bryant Internal Grinders (1942)
Model HRF Barber-Colman Hob & Reamer Sharpener (1942)

LATHES

14"x30" centers Pratt & Whitney, Model C
16"-18"x30" P. & W. Model C (1947)
16"x54" centers LeBlond (1941)
18"x60" centers Pratt & Whitney, Model B
18"x6' American, Gdr. Head, M.D.
19"—38" gap x 10' LeBlond
36"—48"x16' Lehman Hydratrol (1945)
8"x15" Sundstrand, Model D (1943)
10" Sundstrands (1942, 1943)
16" & 20" Fay Automatics (1942)
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4R Libby, Bar Feed (1942)
No. H-5 Libby
No. 5 Bardons & Oliver (1942)
No. 5 Midland, Bar Feed (1942)
No. 1-H Libby, 6¼" Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

MILLING MACHINES

No. 2 SP Van Norman Plain (1942)
No. 2H Milwaukee Plain (1942)
No. 2 H Milwaukee Vertical (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cin. Mfg. (1940)
No. 2—18 Cincinnati, Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex (1943)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 56-72 Cincinnati Hydromatic
4½"x12" Pratt & Whitney, Model C Thread Mill
6"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread (1942)
24"x24"x12' Ingersoll Adj. Rail Slab Miller
36"x36"x16' Ingersoll Slab Miller, 4 Hds.
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)

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Micromatic Vertical & Horizontal Hydrohoners

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36"x36"x18' Gray, Maxi Service, 4 Heads
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#28/60 Vertical Cincinnati Hydrotel, '44
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5" Fisher Horiz. Floor type Boring Mill, Late
Acme Gridley Automatics & Chuckers up to 6½" cap.
#72 A5 Heald Sizematic, New 1945
5" Bar Table type boring Mill, Giddings & Lewis #350T
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BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
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NORTON 6x18" 10x12", 18x36", Type C, Plain, latest
NORTON 6"x30", 10"x36", type C, Pl. Hyd., latest
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BRYANT #16-CP-16, #24 Int. Hyd., latest type
CINCINNATI #2 Centerless "Filmatic," latest type
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HEALD 75A, 72A3, 72A5, 74, 70A Internal, latest
LANDIS #12 Centerless Hydraulic, Latest Type
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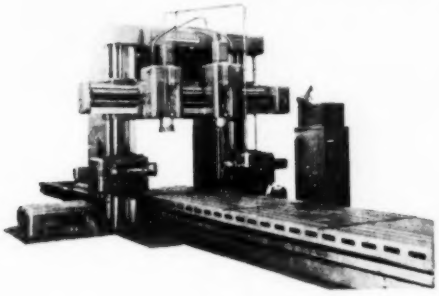

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Nos. 3 & 2MH Cinci. Pl. Dial Millers, late
Nos. 3K & 3H K. & T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 2G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicator, late
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Bridgeport Vert. Miller, slotting (3)
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Hendey 14" x 30" Lathe, G.H., ser. 36188

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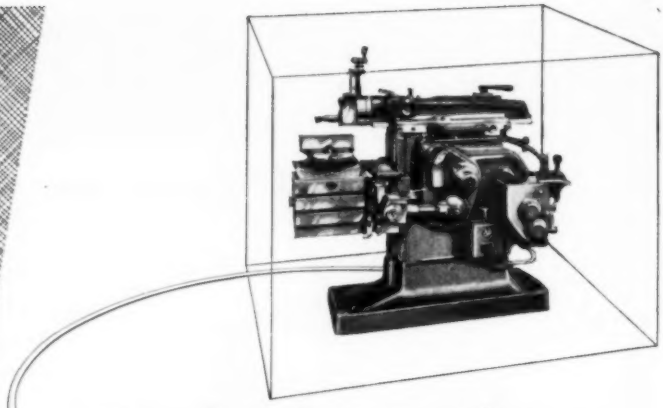
47 Laurelton Rd., Rochester 9, N. Y.



Production Package
ready to go . . .

Buy a Hendey 12" Universal Crank Shaper – plug it in – it's ready to go – without further purchases, because standard equipment *includes* table and vise for positioning and indexing work to any angle. You also get flanged mounted motor, mechanical controls on both sides, automatic lubrication, quick-change swivel head, adjustable, preloaded Timken bearings on the crank gear, plus many other features usually considered "extra".

The Hendey 12" Crank Shaper is finished like a fine watch, both inside and out. Here is an accurate, fast money-maker for tool room and production work. Write today for complete details.

BRIEF SPECIFICATIONS

Length of Stroke	12¾"
Strokes per minute	14 to 200
Speed changes	8
Vertical travel of tool slide	4⅝"
Table top tilts either way	15°
Max. distance vise to ram	8 13/16"
Max. rotation of table	360°
Max. vise opening	10½"
Net weight	2825 lbs.
Floor space	46" x 68"

Other Hendey Machines Include
Tool Room Lathes — 9"- 12"- 14"- 16"- 18"- 20"- 24"
Shapers — 12"- 16"- 20"

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Here's how you cut tool costs when you use Apex sockets and wrenches: **FIRST.** They are accurately machined from electric furnace high carbon alloy bars—cold broached and carefully heat treated to give maximum strength and shock resistance. They are built to stand tremendous strains and shocks. **SECOND.** These sockets and wrenches can be furnished—on request—to definite hardness specifications for best service on specific jobs. **THIRD.** Apex sockets stay on the toughest jobs (self-tapping screws, for example) much longer than ordinary sockets.

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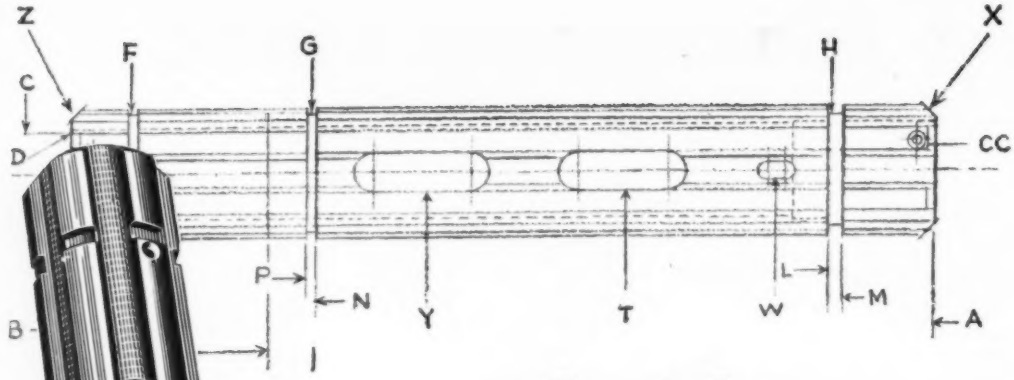

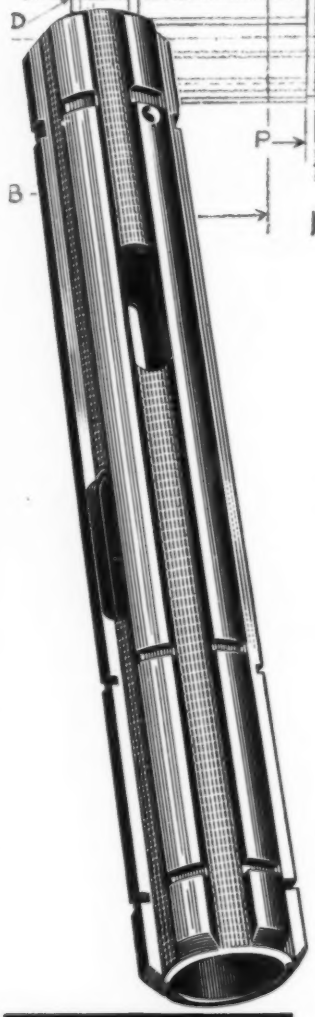

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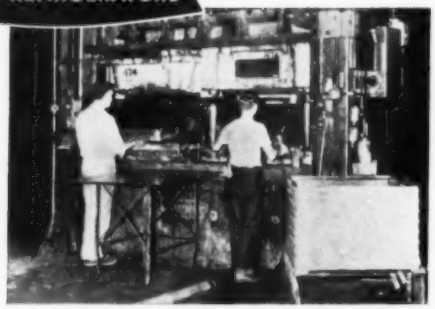

Top appliance producer mass produces accurate parts on Cleveland Presses.

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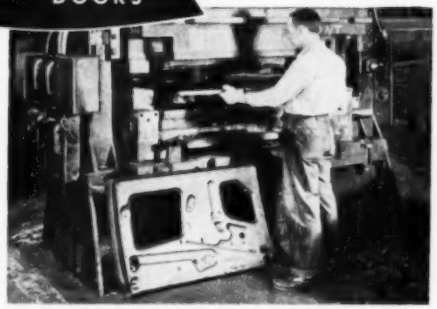
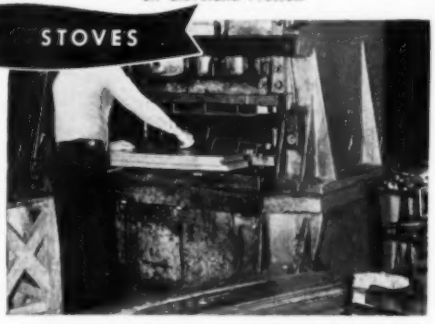


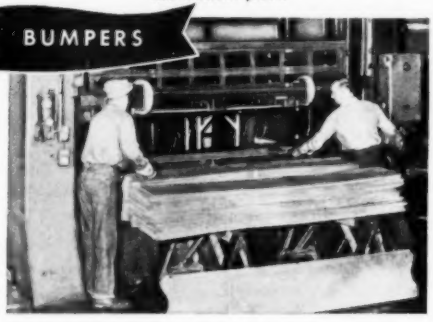
High speed production of automotive parts is required in this modern plant.

STOVES



Prominent stove manufacturer has used Clevelands for years.

BUMPERS



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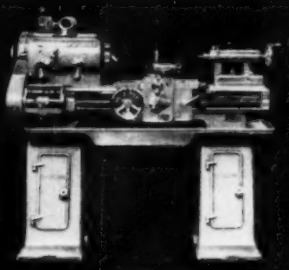

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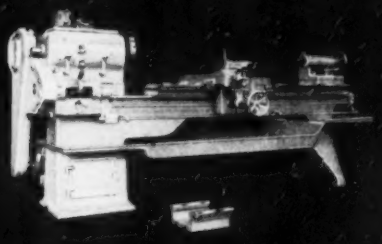
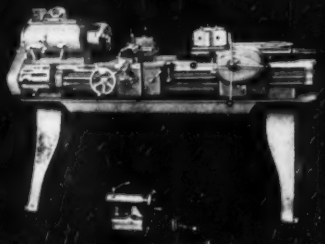


Gap Regals

Bench Regal



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